FACTORY

MANAGEMENT AND MAINTENANCE

A McGRAW-HILL PUBLICATION

MAY 1942

HOW TO BUILD THE WILL TO WIN — page 58
HOW WE GO GET WAR WORK — page 68

RADIANT HEATING IS HELPING PLANTS TO MEET AN EMERGENCY

★ ★ ★

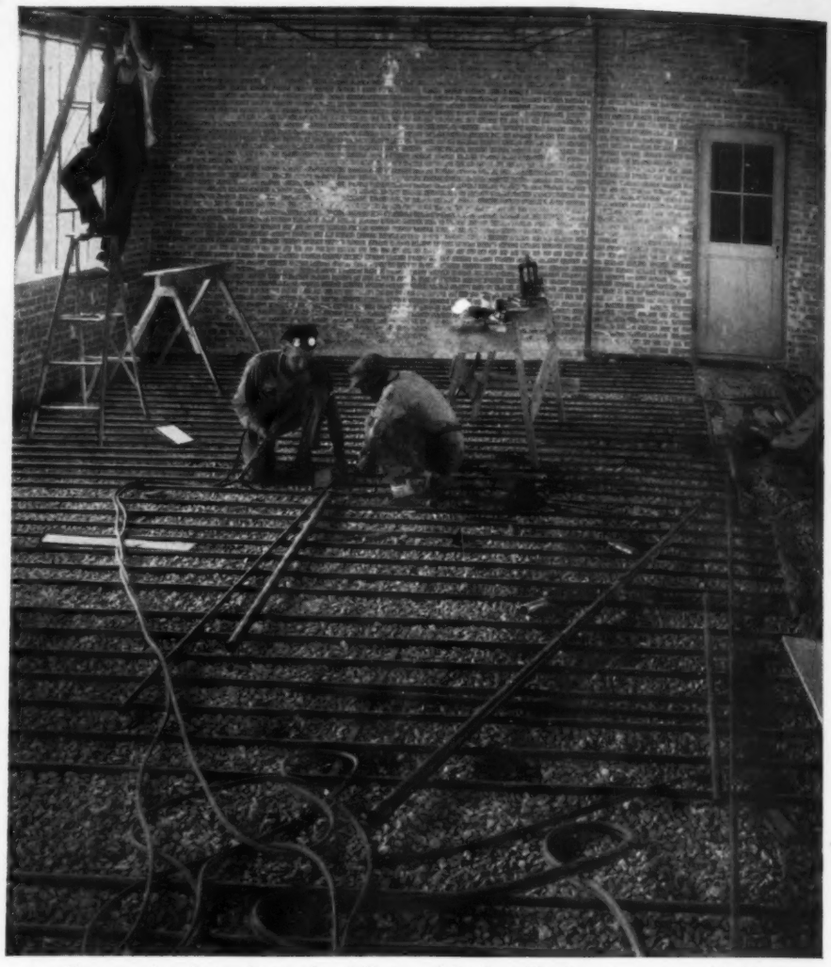
BYERS

WROUGHT IRON

Heating for new industrial buildings is causing a lot of headaches for plant engineers today. Some equipment ordinarily used is no longer available. Certain available types demand extravagant tonnages of critical materials. As a result, many plantmen are giving renewed thought to Radiant Heating, as the best means of getting first-class heating results, and at the same time saving metal the Nation so badly needs.

The savings possibilities are illustrated by a comparative check recently made. It covers a small structure, but illustrates the point. Radiant heating required 930′ of ¾″ pipe—a total weight of 850 lbs. A conventional hot water system of equivalent capacity would require 1700 lbs. of metal, while an equivalent 2-pipe steam system would demand 1200 lbs. (All these figures are exclusive of weight of boiler.)

Industry is well represented in the 400-plus Radiant Heating installations now serving, and results are highly encouraging. A New York concern reports 30 years of satisfactory service from a floor-type job. After several years experience, a Wisconsin Company writes, "We are well satisfied with its (Radiant Heating) operation from all angles." A Steel and Foundry Company official calls their Radiant Heated Building, "the most comfortable we have ever worked in," and says fuel consumption was ⅓ that estimated for a conventional system. Installations have been or are being made, or are on the boards, in Illinois, Michigan, Ohio and Maryland plants.



The speed and simplicity of installation of Radiant Heating is suggested by this progress picture in the administration building of a steel and foundry company. The wrought iron pipe, fabricated into grids, was placed on the gravel bed, and joined with a few field welds. Another layer of gravel was then applied, and the concrete topping poured. Setting and connecting the boiler completes the job.

You will recognize that the nature of the service requires an unusual combination of corrosion resistance, thermal properties, and ease of fabrication in the piping materials used. Actual field service records under identical conditions, and covering periods of many years, have demonstrated wrought iron's claim to these essential properties, and your own experience will confirm it.

Our 48-page technical bulletin, "Byers Wrought Iron for Radiant Heating Installations," is filled with helpful information on design and installation. If you want additional assistance, we will put you in touch with some of the many engineers who have first-hand experience with Radiant Heating in all its phases.

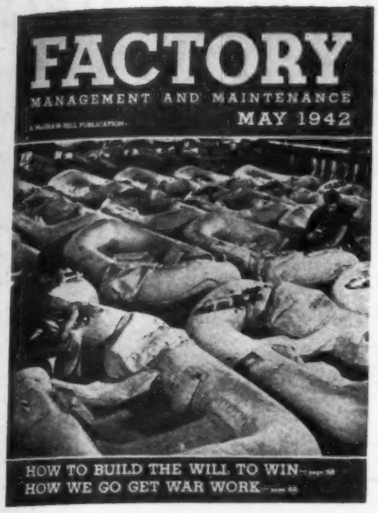
A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

Corrosion costs you more than Wrought Iron

BYERS GENUINE WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

STEEL TUBULAR PRODUCTS



On the cover, some of the reasons why we have to make our tires do for the duration. Thousands of pneumatic boats are joining the flood of war materials flowing from the big rubber plants. Boats are quickly inflated by opening a cylinder of carbon dioxide. This is the type of raft used by three Navy aviators recently forced down in the Pacific, who reached land after 34 days of exposure. Kodachrome by courtesy of The Goodyear Tire & Rubber Company.

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A McGRAW-HILL PUBLICATION

FACTORY

MANAGEMENT AND MAINTENANCE

MAY · 1942

Add to Management's Jobs.....*L. C. Morrow* 57
How to Build the Will to Win..... 58
How We Go Get War Work.....*Earl D. Power* 68
Shift Schedules for 168-Hour Operation..... 72
Employee Suggestions
Plant Operation Library No. 51..... 73
How We Doubled Production.....*P. A. Abe* 85
Significant Labor Developments..... 89
Our Goal for 1942: A Million Pounds of Cardboard Saved.....*LeRoy Hostetler* 90
Welcoming the New Man.....*Robert Jones* 92
What Operators Ought to Know About Cutters.... 94
Management Shorts 95
Maintenance as the Editors See It.....*editorials* 98
To Keep Little Motors Going When the Big Motor Starts.....*W. K. Boice* 99
Ready for Raids.....*William F. Robbins* 101
What Cold-Cathode Fluorescent Lighting Is..... 113
Scheduled Lubrication Saves Oil, Machinery, and Time.....*J. L. Looney* 115
Incentives Cut Wiring Costs
C. H. Brechin and P. M. Matthews 118
How to Save Towels and Tissue..... 120
Maintenance Shorts 122
Data Sheet: When to Replace Wire Rope..... 126
You Want to Know..... 128
What's New in Equipment..... 136
Books 234
Calendar 238
Catalog Service..... 246

HOW H&D IS PACKAGING WAR MATERIALS

MUST BE PROTECTED

Here's an example where "business as usual" fits the needs of war. Studying the product, determining where it will need shock-absorbing protection, anticipating damage before it occurs and then beating it to the punch, is all in a day's work for H & D Package Engineers.

Emphasis upon "shipping boxes that protect" characterizes present production at H & D factories, where capacity work-schedules are being followed to meet the demands for millions of corrugated boxes essential to all-out war effort. However, the normal need for "packages that promote" has not been forgotten; the H & D Package Laboratory is also working to develop new styles of sales-stimulating packages to help you prepare for tomorrow's competitive markets.

Whether your packaging program is one of protection or promotion, you'll be days and dollars ahead to discuss your problems with an H & D Package Engineer. Write today.

SAVE AND SELL WASTE PAPER

HINDE & DAUCH *Authority on Packaging*

4247 DECATUR STREET, SANDUSKY, OHIO

FACTORIES IN BALTIMORE • BOSTON • BUFFALO • CHICAGO • CLEVELAND • DETROIT • GLOUCESTER, N. J. HOBOKEN • KANSAS CITY • LENOIR, N. C. • MONTREAL • MUNCIE • RICHMOND • ST. LOUIS • SANDUSKY, OHIO • TORONTO

FACTORY
MANAGEMENT AND MAINTENANCE
L · C · MORROW · EDITOR

Add to Management's Jobs

Two scarcities could prevent full accomplishment of our colossal war production program this year. They are scarcity of materials and scarcity of manpower. Both are largely controllable by the management end of industry.

"The greatest source of metals today is above the ground," said one of the top WPB officials recently. He meant that conservation and salvage of metals can reduce scarcity; also that not using metals for non-essential products will make them available for war purposes.

Salvage of materials is something that every plant can do something about. Most dramatic, and very productive, will be the first big clean-up –scrapping the obsolete, giving up the surplus, dragging out the hidden. After that will come the more prosaic, but equally effective, job of continuous salvage—of metals, rubber, oils, and all other scarce materials.

So is conservation of materials something that every plant can do something about, but more indirectly. As more and more plants change from civilian to war work, fewer plants have the say-so on specifications. Their efforts to conserve by means of redesign and substitution must take the form of suggestions, not decisions. Their big conservation opportunity is to get most production out of existing equipment, and at the same time make that equipment have long life so that a minimum of replacements will have to be built.

The second scarcity, manpower, is resulting from two causes: (1) The young men who can do the best work in war production are also the men the army must have; (2) the people who are losing their non-essential jobs will have to be retrained for war work.

Factory has suggested (February, 1942) that eventually the government will take the responsibility for industrial as well as military placement. The recent establishment of the War Manpower Commission is a move in that direction. So far it is only a move, but it paves the way for legislation that could give extraordinary powers. Possibly it will be necessary to go all the way. But there are things that can be done by industry which might make all-out action by government unnecessary, and certainly would make the transition less painful if it came.

These things are relatively simple. They include: Employing older people, partially disabled people, and women. Training people for future as well as present employment. Analyzing jobs and classifying as many of them as possible for occupancy by other than army desirables.

In some of the enemy countries the proposals made here would be considered elementary or unnecessary. In this country, habituated to abundance and extravagance, they are neither. And they should not be disregarded. We cannot afford the risk of letting these two scarcities either jeopardize our winning or delay its coming.

L C Morrow

How to Build the

Theme: "Save!" Slogan: "Crack the Jap!" Dayton Rubber uses posters, stickers, films, news

A JOB FOR LEADERSHIP

American industry has the technical ability, the equipment, and the man-power to "lick Hitler and the Japs." The task, however, calls not only for the complete mobilization of men and machines but also for a smashing extra effort on the part of every worker in every plant.

Primarily the power to beat time, and so beat the Axis, lies in the hands of labor, by virtue of its strength, skill, and numbers. But management, by virtue of its natural position of leadership, holds the key to that power. Management can—by leadership, by education—call forth the extra efforts of millions of workers, many of whom still do not quite understand the fearful necessity for speed.

We do believe sincerely that the same spirit that

AMERICAN INDUSTRY, now definitely on the offensive, is making great strides in developing a potent new weapon—the will to win. For here management finds America's answer to the whiplash "efficiency" that the grim slave-masters of the Axis induce by harsh means.

One industrial company after another has launched, or laid plans for, some form of production-stimulating drive. Company after company is finding that the will to win doesn't "just happen," but that it must be *built*, built by individualized methods attuned to certain basic principles.

And it *can* be built! As a matter of fact, the production drive is not an entirely new thing. Under other names it has been utilized effectively in peacetime. In one instance it is known to have produced a 17 percent increase in production—long before the war.

The wartime brand of production drive—or morale campaign, as you choose—is quite new, however. The RCA Manufacturing Company's "Beat the Promise" campaign (described in March FACTORY) remains to date the most intensive, comprehensive, and probably the most fruitful single example. Meanwhile new entries are developing new techniques, affording new lessons. It is the aim of this article to explore further the principles which experience is beginning to reveal.

First, to sum up. Previous articles on the subject have shown these conclusions to be basic:

1. Companies are definitely *not* expected to wait for a man from the War Production Board to appear at the plant with specific instructions for setting up a campaign.

2. There is nothing compulsory about WPB's War Production Drive. Every company's participation *must* be voluntary or it cannot succeed.

3. The morale job is one of education primarily, and it is a job in which *management must take the lead* because most of the major decisions involved are management decisions.

Now comes the question of labor-management committees. Undoubtedly they will be widely used. Yet WPB never intended to *command* their formation, nor did it plan to project labor into management's natural domain. WPB Director Donald M. Nelson was quick to make that plain when a wrong impression was caused by the seemingly mandatory

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Preceding articles in the current series of which this article is a part, include: "Maintaining Worker Morale," August, 1941; "Play Tells Company Story," September; "Let's Go! Say Cleveland Defense Workers," December; "Better Morale, Greater Output," January, 1942; "How RCA Builds Worker Morale," March; "When Workers Get the Will to Win," April.

WILL TO WIN

Industry tackles a vital new war job, quickly develops techniques. Here's a progress report on the nation-wide drive to beat time and the Axis

lifted British industry to well-nigh superhuman achievement after Dunkirk is astir in American industry today. Management has turned its back on "business as usual" for the duration of the war. Labor has virtually renounced the strike weapon, has abandoned Sunday double time.

In such a spirit there is something to take hold of, something to build on. Yet much remains to be done. Management must make men and women feel the war, make them hear the clock-tick of fate, and so arouse the emotional determination to produce.

In the war production drive (morale campaign, or what you care to call it) industry finds a rare chance to rebuild labor-management harmony. In one plant after another, petty grievances, absenteeism, and bickering have vanished in the presence of positive, cooperative action on the war effort.

But the one big reason for such action outweighs all others. The nation's fate and the freedom of the world may well depend on our ability to liberate every pent-up man-hour of precious skilled and semi-skilled productivity in the crucial months ahead.

Perhaps we have been too prone to blame French labor alone for France's downfall. French labor was, to be sure, falsely led. But possibly French industry as a whole lacked leadership. If that is so, the lesson is plain. Positive leadership now is an imperative—an absolute obligation—of American management in the current crisis.

The alternative?

"This," says Donald M. Nelson, "is our last chance to show that a free economy can survive."

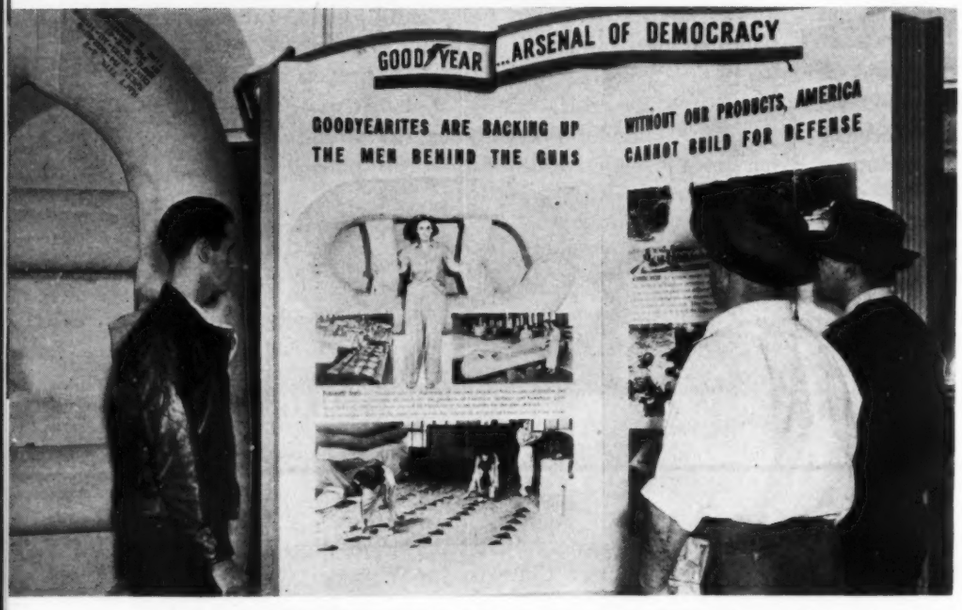
Strong words, those. Too strong, possibly. But let's not wait to find out. France waited. And France found out.

THE EDITORS

A labor-management committee is born. Impressive ceremony in hotel ballroom lends weight to occasion as Westinghouse Cleveland Works launches comprehensive "Quicker for Victory" (Q4V) drive

U. S. Army Signal Corps

Col. A. Robert Ginsburgh (right), who heads Army "plant visits," gets up-to-the-minute pointers on war production from an expert


GOODYEAR ...ARSENAL OF DEMOCRACY
GOODYEARITES ARE BACKING UP THE MEN BEHIND THE GUNS
WITHOUT OUR PRODUCTS, AMERICA CANNOT BUILD FOR DEFENSE

Goodyear ties its products to war with attractive plant displays

Houde Engineering workers get a kick out of the sign they made

language of the first Official Plan Book, issued by WPB War Production Drive Headquarters to some 2000 war plants.

Far more moderate in tone is the Plan Book Supplement, since issued for wider distribution. The Supplement may be obtained by addressing War Production Drive Headquarters, War Production Board, Social Security Building, Washington, D. C.

Some 500 companies, as of April 17, had reported to WPB the formation of labor-management committees. A study of the first 200 indicates that average committee membership ranges from 6 to 13, and that the majority of the committee chairmen are management men.

All early reports indicate that the committees are operating harmoniously. Undoubtedly there will be squabbles here and there. For example, it seems unlikely that every committee will succeed in avoiding such collective bargaining problems as that of wage incentives.

Need to Exchange Data

But committees, in the main, will flourish. There are ways in which they can be set up to function as genuine instruments of cooperation rather than as battlegrounds of jurisdictional ambition. Later in this article we shall examine one or two instructive committee cases.

FACTORY repeats: *With or without committees*, production drives can succeed. FACTORY also urges managements to develop their own techniques, making full allowance for special plant conditions. Ideas can also be adapted, and managements are urged to exchange data on the practical application of different devices.

WPB's War Production Drive headquarters will *not* function as a source of specific instruction. It does not have, and does not plan to set up, a staff to analyze or disseminate the limited data it receives on procedures. It will function as a source of "ammunition"—posters, slogans, motion pictures, transcriptions, editorial matter. But it does not want to prescribe techniques.

Nor does FACTORY. But after visiting many plants and corresponding with many others, FACTORY is prepared to present a number of ideas

(*Continued on page 65*)

A catalog now lists all the posters, films, pictures, transcriptions, and other services available to industry through various government agencies. To obtain a copy, address: War Production Drive Headquarters, Social Security Building, Washington, D. C.

New WPB posters on this page may be ordered from same source. When writing, refer to serial numbers: Series A-3, upper left; A-4, upper right; A-1, lower left; A-5, lower right. Series A-2, not shown here, is a 10-ft. streamer "Every Minute Counts"

Photographs of posters by courtesy of Office of Emergency Management

Posters displayed on these two pages are samples of the scores that are commercially available. For information address the following: (1) and (2) Kelly-Read & Company, Rochester, N. Y.; (3) and (4) The Sheldon-Claire Company, 520 N. Michigan Avenue, Chicago; (5) and (9) British & American Ambulance Corps, 420 Lexington Avenue, New York; (6) and (7) Hungerford & Sherman, 921 Union Trust Building, Pittsburgh; (8) and (10) Elliott Service Company, 219 E. 44th St., New York; (11) and (13) National Safety Council, 20 N. Wacker Drive, Chicago; (12) The Griswold-Eshleman Company, Cleveland

"Sweat, fella—sweat! The more we sweat, the less our boys bleed. Let's give 'em what it takes to knock out the enemy."

PRODUCE FOR VICTORY!

"Yesterday, I was a free French worker. Today, I am the slave of the invader. Believe, mon Americain, nothing is important but to keep your freedom—to produce, to build tanks, planes, guns. Destroy the enemy who would take your freedom. For your sake—for God's sake—

PRODUCE FOR VICTORY!

5

6

AFTER A
NEW SPEED
RECORD!
CO-OPERATION
PRODUCTION
If Uncle Sam's wheels throw a tire or his engine starts missing, LOOK OUT! This is a race for national defense and it will be just TOO BAD IF WE LOSE!
You are a PRODUCTION SOLDIER...
America's First Line of Defense is HERE

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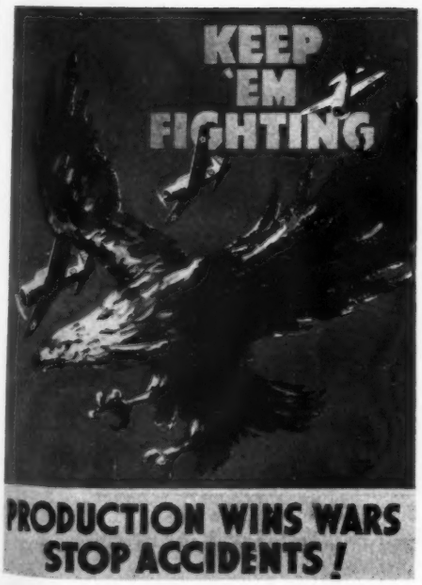
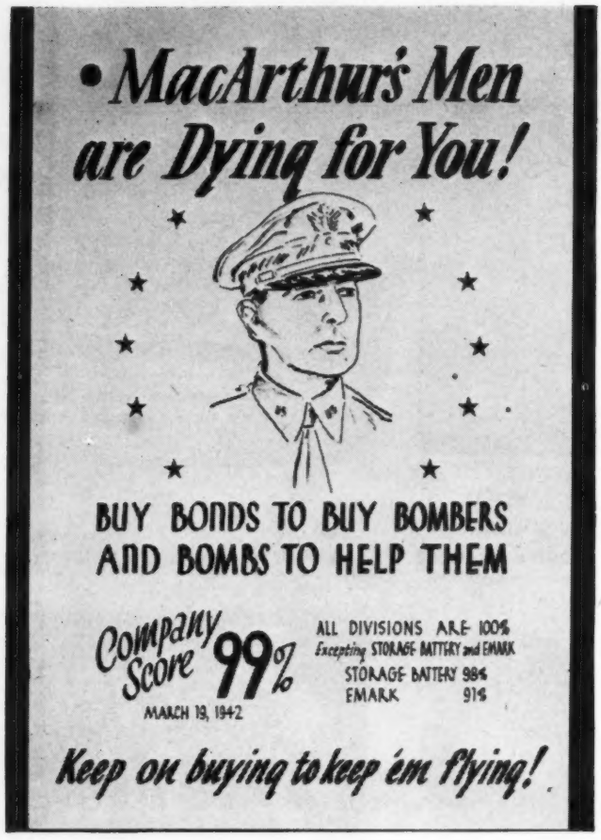
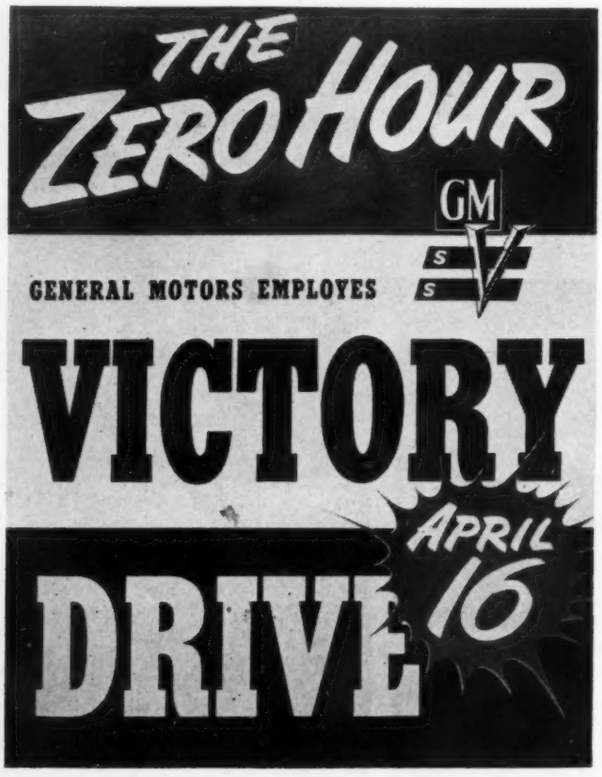


SHOW-
DOWN
HERE IS THE SHOWDOWN:
Can Hitler and Hirohito drive their people to work harder than we are willing to work?
There is no one in America to drive us. We must drive ourselves.
What is your answer, fellow workers?
only Work can make US STRONG!


• MacArthur's Men are Dying for You!
BUY BONDS TO BUY BOMBERS AND BOMBS TO HELP THEM
Company Score 99%
MARCH 19, 1942
ALL DIVISIONS ARE 100%
Excepting STORAGE BATTERY and EMARK
STORAGE BATTERY 98%
EMARK 91%
Keep on buying to keep 'em flying!

187,000 TANKS
COULD HAVE BEEN BUILT LAST YEAR WITH THE TIME LOST BY INDUSTRIAL ACCIDENTS
HERE'S THE SCORE
17,000 WORKERS - KILLED
93,000 WORKERS - CRIPPLED
1,250,000 WORKERS - OUT OF PRODUCTION AN AVERAGE OF 20 DAYS EACH
PUT AN END TO THIS NEEDLESS SORROW AND WASTE
TAKE CARE OF YOUR COUNTRY BY TAKING CARE OF YOURSELF!

Here are a few samples of posters used by individual companies. Top left, one of a series that enabled Thomas A. Edison, Inc., to get 100 percent War Bond support in all plants. Top right, Manning, Maxwell & Moore. Lower left, General Motors War Bond drive. Lower right, Douglas Aircraft



(Continued from page 60)

and to classify what seem to be: (1) The chief *objectives*, (2) the chief *activities* and *tools*, and (3) the apparent key *principles* of successful campaigns to increase production.

Under the heading of objectives come any plans to:

1. Stir up thought, usually by intensifying existing suggestion systems or creating new ones. (For a thorough discussion of suggestion system techniques, the reader is referred to Employee Suggestions," a special section in this issue.)

2. Stir up action, by stimulating the competitive will to win with interdepartmental or interplant production contests, production scoreboards, and merit awards, group or individual.

3. Fight waste.

4. Fight rumors and gossip.

5. Fight the war on the home front with cooperative action on War Bond sales, Red Cross collections, blood bank donations, first aid classes, air raid precautions, and the like.

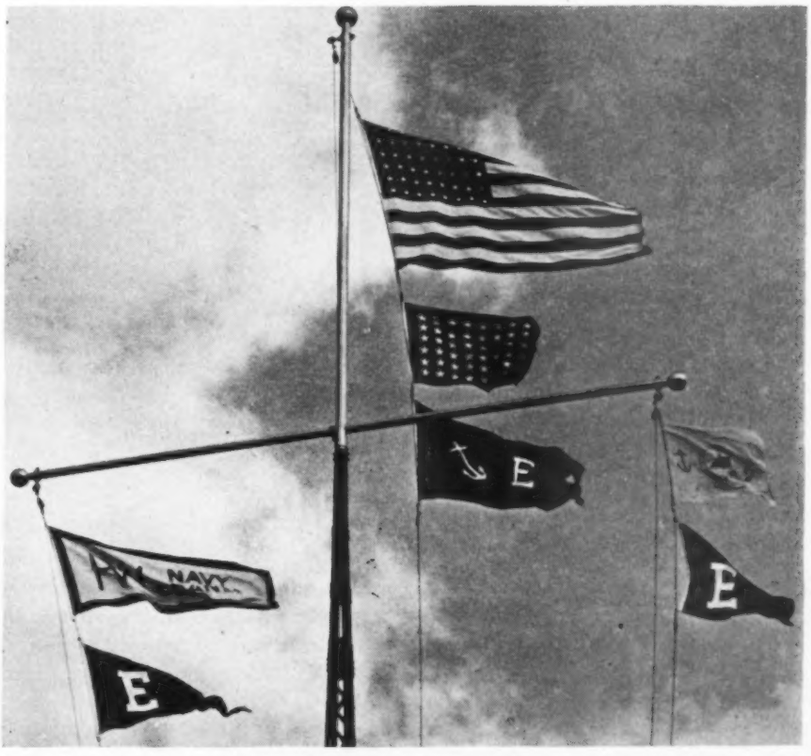
Activities and *tools* include every possible appeal to eye, ear, and emotion. They may be employed in an endless number of combinations and in pursuit of one or several objectives. It is impossible to arrange them in the order of their importance, but they include: Rallies, meetings, and speeches; plant visits from delegations of high-ranking Army officers; ship launchings; Navy "E" awards; family plant visits (where possible); newspaper and radio publicity (where permitted); house organs; posters; banners and streamers; pledge cards; windshield stickers; pay envelope inclosures; merit badges; home mailing pieces; slogans; songs; sound system transcriptions; and motion pictures.

This is to name but a few. With each new campaign, new adaptations and new devices are being found, such as the "overseas" caps workers now wear in some plants, and the smart, semi-military uniforms girl workers wear in others.

The guiding *principles*, deducted from the experience and comments of management, appear to be these:

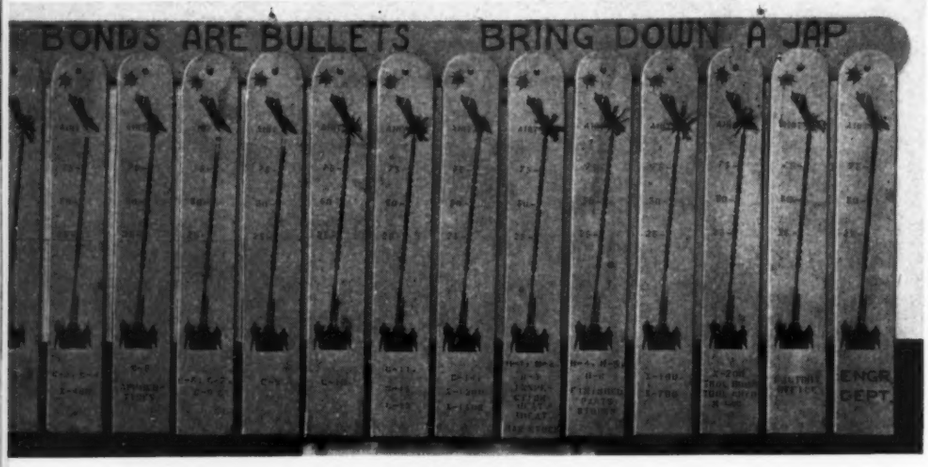
1. No drive can succeed unless it first clearly establishes the connection between the plant's product—primary, secondary, or remote—and the war

They have a lot of respect for delivery dates at Harnischfeger Corporation, Milwaukee, and now they're out to "Beat the Schedule." Output, stimulated by Pearl Harbor, gets new lift from scoreboards



Proudly the Dravo Corporation of Pittsburgh flies its All-Navy "E" flags, a rare distinction. Proudly Dravo employees and families heard praise from Navy heads and Lowell Thomas at ceremony in shops

Axis ration (left) startled the employees of Rochester Products, General Motors division, at a company dinner. Voice on amplifier drove home the moral. Then skimpy fare gave way to hearty roast beef



Everybody bought War Bonds and "shot down the Japs" on scoreboards at affiliated Columbus McKinnon Chain and Chisholm-Moore Hoist plants in Tonawanda, N. Y. Both plants hit the 100 percent mark

effort. Only then does the employee feel the importance of what he is doing.

2. Every effort should be made to bring the war *home*, to make employees *feel* war as an actuality.

3. Appeals should hit hard at the emotions, but flag-waving, as such, should be avoided. The most successful appeals are basically factual.

4. Often a single activity, such as a War Bond drive, may do a big morale-building job in itself.

5. Committee or no committee, employee participation is essential. In most unionized plants it has been found that union officials will welcome a chance to go on record publicly in appeals to employees for unrestricted all-out production.

6. Timing is a highly individual question but one rule should prevail: Never let an appeal get "stale" or grow cold.

Following are some practical examples of activities conducted, tools used, and principles applied to the job of building the will to win:

Tying Product to War

If you make an obscure tank part, and you want to get a tank from the Army to show to your employees, you may do so at some expense to yourself. But the War Department will make no charge for speakers, house organ material, motion pictures, posters, and the like.* At Bethpage, N. Y., recently, 8500 Grumman Aircraft workers went back to their jobs with new vim after watching special Navy motion pictures of Grumman fighting planes in action against the enemy.

Goodyear employees get a larger view of their jobs (which may be simply applying cement to fabric) when they inspect poster exhibits (see illustration on page 60) or read their colorful employee magazines. Goodyear families may also visit exhibits of the company's less-secret war products. At Buffalo Arms a sample of the product stands in a showcase in the company cafeteria.

Bringing the War Home

At Allison Engine a prominent exhibit is a bullet-riddled Allison engine which stood up brilliantly in combat and brought its precious cargo of American lives victoriously home. At an employees' banquet, Rochester Products had the men served with skimpy "Axis rations" resembling dog food, while a voice on the amplifier intoned the obvious moral. Then the men got roast beef. The Porter-Cable Machine Company of Syracuse, N. Y., displays pictures of menacing Axis

* To arrange for plant visits by Army personnel, address Col. A. Robert Ginsburgh, Director, Industrial Information Branch, Office of the Under Secretary of War, 5723 War Department Building, Washington, D. C. This branch also supplies editorial material, films, and posters, as do the War Production Board, the Office of Facts and Figures, and other government agencies. A catalog of all available government posters, pictures, films, transcriptions, and other services may be obtained by addressing War Production Drive Headquarters, Social Security Building, Washington, D. C.

Answer him! Prizes are offered to employees of Porter-Cable Machine, Syracuse, for the best retorts to the sneering Nazi and his Axis aides. It's part of a broad drive for best answer of all—speedier production

For the convenience of rumor-mongers, Lockheed Aircraft installed this novel board (right). To date no customers have appeared

soldiers and offers prizes for the best answers to their jibes. Other more common devices are service men's honor rolls and service men's news in house organs. First aid and air raid drills bring the war home, too.

Suggestion Systems

During "MacArthur Month" at Bausch & Lomb Optical Company, Rochester (April 6 to May 9), the usual suggestion system awards were doubled while $5000 in extra premiums were offered. Three little figures labeled "Think," "Work," and "Save" pervaded the plant and the employee publications. General Motors has set up special $1000 contests for suggestions in all its units. Many companies are making extra awards in defense bonds now—and making extra ceremonies of the awards.

Scoreboards and Awards

The appeal to the competitive urge is a strong one, yet scoreboards and similar devices have not been developed widely as yet. To the individual management they may present special problems. Censorship is one—but this can usually be circumvented by the use of percentages. Large single-product plants, for example, have this advantage—they can more easily choose some quantitative basis, such as tonnage or dollar value, whereas diversified plants may need time in which to establish relative performance standards. Yet scoreboards (such as those pictured in

(*Continued on page 186*)

Community ceremony in school auditorium set stage for pledge of allegiance taken by employees of the Campbell, Wyant, & Cannon Foundry at Muskegon, Mich. (Details in *Factory*, April, 1942)

War products committee of junior executives meets daily to decide what to bid on and what to leave alone

How We Go Get War Work

Story of a concern that stood to lose half or more of its production—and what that concern is doing to keep its factories running and its organization intact

EARL D. POWER, President and General Manager, Lyon Metal Products, Inc., Aurora, Ill.

THIS ARTICLE is written to pass along to other manufacturers, for whatever assistance it may give them, our company's experience in obtaining and handling war orders. Until very recently, it had not entered our minds that we were doing anything ingenious or more than ordinarily effective. Then one of our officers made a number of calls upon other firms, in search of certain subcontract information we needed. To his surprise, almost every manufacturer on whom he called was much interested in the policies and the mechanics behind our plan.

What drew most other folks' attention to our active campaign for war orders was our series of advertisements—still running—in business publications, setting forth to holders of war contracts highly specific facts about our plants, equipment, experience, and know-how in working sheet steel of gages No. 8 to No. 30. This advertising is an important part of our effort to obtain high-priority contracts, but it is only a part. Actually, it bears almost the same relation to current sales work as does our regular advertising to regular selling in times of peace. The advertisements bring in direct inquiries, but are most important in familiarizing prospective customers with our name as a potential source, thus paving the way for our field representatives.

It is hardly necessary to point out to other priorities-beset manufacturers that for the past two years industrial conditions have been changing so rapidly that a set of major policies may not long remain effective. In our company we have had to shift our sights at intervals never longer than two months. Early in 1941 we were straining to manufacture as much as we could sell. By midyear of 1941 our

worry was whether we could get the materials for as much product as we then knew our plants could produce.

During all of 1942 to date, we have been asking ourselves whether we can find enough war business, for which materials will be made available, to keep our factories running satisfactorily—and whether the prices obtainable on such business will permit earning a modest, normal profit.

For many months, it has seemed to us apparent that the only manufacturing establishments that could count on operating to the end of the war were those producing either war goods or else absolute necessities for the civilian population. Certainly the last chance for "business as usual" disappeared with the attack on Pearl Harbor. But the industrial manager who had not resigned himself long before December 7 to full war conversion was an incurable optimist.

As a matter of fact, maybe we were slow because we did not start to talk about the necessity for war orders until the fall of 1940 and did not organize for all-war production until early in 1941.

Like most companies that manufacture many product lines, of which only a few are essential in war, we faced a difficult problem of obtaining war orders. After all, we are sheet-metal fabricators, and the best estimates indicate that this country has at least ten times as much sheet-metal shop capacity as the Army and Navy need. Military goods are chiefly made from hot metal—forgings and castings. If we were to get enough business to keep our plants going, we must unquestionably expose ourselves to contact with the institutions and companies that have sheet-metal war orders to purchase.

First a Sales Problem

Thus in our case the problem of war production necessarily started as a sales problem. We had to learn how to obtain this business, which was brand-new in our experience, before we could get our manufacturing program under way. So we started to talk up war business to our sales force, to convince our field men that they should beat the bushes for all possible munitions jobs that we could manufacture. This was an almost impossible educational task at that time. Our long-established products are sold principally to business and industry, and in the early months of 1941 our men were getting standard product orders in such quantities that most of them were earning good salaries and commissions. It is difficult to convince anyone in the midst of a boom that he had better abandon his big-profit possibilities.

Yet this is exactly what we undertook. We called more frequent regional sales meetings. By the second sales conference of 1941, our field men had not moved sufficiently in the indicated direction. They admitted that firms in their territories were getting into war business, but said that nobody wanted to give us any. Their most common excuse was:

"I'm kept so busy taking care of our regular customers and their big orders that there are not enough hours in the day to spare for hunting war orders."

They had not yet felt the effects of curtailment of materials, were not yet sufficiently jarred to recognize the importance of the idea.

Our sales manager continued to exhort every field man:

"Sure, you're a sales engineer, but have you imagination? We don't know what we can make along these lines. Can you help us find out? Throw away your slide rule, think yourself right inside a tank, and see what there is in there for Lyon."

Throughout the United States, we required the sales force to hunt out every governmental agency to find out its place in the picture of war business. We brought together all this information at the general offices, and presently knew what each agency develops, designs, or specifies, its present and probable future requirements, and the key people to see.

We made each field representative maintain regular contact with every government purchasing body in his territory, and with every holder of a war contract that might yield sheet-metal orders. We asked each district manager to accompany his salesmen on visits at least once a month to each of the most important potential sources of war orders on this list. This is not a task for a swivel-chair manager, or a telephone salesman.

Although we were insisting on this

"To date," reports Lyon's president, "we have managed to operate our plants at or near capacity since the first of 1941. All our production now is directed into the war effort and carries high priorities. Whatever part of it is not special war products on prime contracts or subcontracts, is our own standard products which are essential to the armed forces and war-product plants. Within the next 30 days, some of these standard products heretofore considered essential are being drastically curtailed or prohibited by the War Production Board. Therefore, the program we have outlined is but a starter in the all-out war conversion problem we now face.

"Can we go farther with our type of business in converting to war production to replace these standard products now being curtailed? We have no alternative. There can be only one answer. Nothing counts these days unless we win the war. Nothing will be left undone by our organization to extend our conversion program. Only then will we be able to keep our employees on the job, and, working together with faith in our country and in ourselves, come out on top for our country and for our own company in the difficult days ahead"

GENTLEMEN: WE WANT PRODUCTION RUN DEFENSE WORK
LET'S GO!
Doing Our Own Job Well is Not Enough
WE WANT Production Run DEFENSE WORK
CAN MAKE IT
SEE IF LYON CAN MAKE IT
Craftsmen in NATIONAL DEFENS
Two Large Manufacturing Plants . . . Over Half a Million Square Feet of Manufacturing Space . . . 40 Years' Experience Perforating, Blanking, Forming, Assembling, Enameling and Lacquering Sheet Metal in Gauges No. 10 to No. 24 . . . Assembly Plants on Both Coasts.
GET ALL THE FACTS
LYON METAL PRODUCTS, INCORPORATED
LYON METAL PRODUCTS, INC.
Craftsmen in NATIONAL DEFENSE

Advertisements in business publications play a big part in Lyon's active efforts to get high-priority contracts. They set forth facts about the company's plants, equipment, experience, and know-how in working sheet steel. Brochure, bottom row center, shows items Lyon can make, and lists equipment

routine, most of the field men no more than half believed in the idea—although a few self-starters began devoting some time and sales ingenuity to customers who needed help with military articles. Last November, to cap the climax of our salesman education, we called in every man for a headquarters meeting. Our sole purpose was to make them comprehend that going after war orders was not trying to do business the hard way, but rather was the only way that all of us could remain in this business and earn our livings. Remember, please, that before the United States became a belligerent it was difficult to find any sizable group of people in which everyone comprehended the patriotic importance of producing military supplies.

By November, however, it was apparent to our sales management that preaching and prophesying to the sales force would not get the desired results fast enough. The problem had to be dramatized. So, for our sales

convention, we brought in professional dramatic talent to hammer home in a series of stage skits how and why we could get what were still referred to as "defense orders."

One of these skits took a typical Lyon salesman through a typical discouraging interview with a purchasing agent. The customer was so familiar with us as a source of stockroom, shop, and locker-room equipment that he could not think of us in terms of parts for his company's tank contract. Instead of accepting the brush-off, the stage salesman induced the purchasing agent to introduce him to the firm's manager of subcontracting. Thereupon, after some preliminary explanation about our expertness in making things out of sheet steel, our man obtained several sets of blueprints to send back to our factory for quotations.

Somehow that particular incident on the stage helped mark the turning point in the minds of our sales representatives. Taking this case as a model, they really began to go after war business.

Had to Get the Answers

So much for the selling job. There were still all manner of major problems to be solved in connection with plant engineering, product designing, and factory scheduling of this new type of work. From our earliest experience with war orders, in the spring of 1941, we had learned that these could not be put through the ordinary routine. War products were invariably strange to our experience and habits of thought, even though some of them turned out to fit our shop equipment just as well as our standard products. But each special product raised several questions. Before we could bid, we had to get the answers. Had we all the machinery required to make this item? If not, could we get this machinery, and was the order large enough for the cost to tool up? Or could we perform part of the work and job out the rest? Could we get the material from which to make the product? What would the finished unit cost us, ready to ship?

Also, and basically important in Army and Navy orders, could we make the stipulated shipping date? Would each required unit of our machinery be available when needed for this order, or would it be occupied with other, equally necessitous, war material? Any manufacturer must recognize that he will rarely be given what in civilian business would be considered a reasonable manufacturing time. Our plant executives say that most war orders carry a time allowance that makes production physically possible, but never comfortable.

As inquiries began coming in from our sales offices, accompanied by drawings and specifications, we first undertook to handle them in the same manner as we had worked when the morning's mail brought orders for only such everyday, familiar products as shelving, production boxes, or lockers. Presently it became clear that our sales executives were spending an undue share of their time running around our offices, checking on debatable points. Also, the drain upon the attention of our senior executives was excessive, because a junior executive faced with such an unfamiliar gadget as a soldier's foot locker, a machine-gun ammunition box, or a bomb-fin crate, took the problem to his boss.

Instead of setting up a new department to handle war business, we decided to do it by a committee. Instead of placing our senior executives on the war products committee, we picked the junior executives and gave them full responsibility. Thus the plant engineer represents the production department; the manager of the steel products department represents sales; and the other two regular members represent engineering and development. The chairman happens to be an assistant to the general sales manager; he was chosen to head the committee because he has an all-round company experience, including actual production experience.

Each committee member is respon-

(*Continued on page 197*)

Minutes of War Products Committee

Meeting of March 30, 1942

Called to order 1 p.m. All present but second production department member.

Inquiry 1. [redacted]* Priority A-10. Quantity, 540. Not a sheet-metal product, really a hardware item. We have no equipment for making this efficiently. It is normally outside our line. Don't bid.

Inquiry 2. [redacted] Priority A-1-a. Lots, 100,000 or multiples. We have previously quoted on this, know exactly how to make it, can make it readily on our equipment. Make sure we get on list for future invitations to bid.

Inquiry 3. [redacted] Priority A-1-a. Quantity, 1450. Can make it if riveted. Figure it.

Inquiry 4. [redacted] Priority A-1-c or better. Quantity, 1000. These are large units, a large contract, with a big potential. Would have to run in lots of 250, to save space. Because of size, would have to assemble on a skid. Chairman comments: "I think we can estimate it, but certainly need expressions of opinion from all present on a job as important as this." All favored figuring it. Engineering department points out that engineering this alone will take three to four weeks. Says: "We will have to lie awake nights to figure out those joints." Consensus: We can estimate accurately on most of this, can make a good guess on the rest. Biggest thing of the sort we have handled.

Inquiry 5. [redacted] Priority A-1-a. Quantity, 500. Requires a ¼-in. cast steel top. Only way we could make it would be to brake it and flange it. Would have to get casting made by an outside supplier. After discussion, decided that we must get the top entirely finished from the supplier. We must design and detail the job before we decide whether to quote on it.

Adjourned 1:38 p.m.

* (Names of products deleted)

Shift Schedules for 168-Hour Operation

Factory continues its series of shift schedules designed to show how war plants are utilizing machines to the fullest extent—i.e., 168 hours a week

GANG NO. 1

WEEK BEGINNING APRIL 12

	TIME	SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
MACHINE No. 1	7-3	32	44	44	44	44	44	44
	3-11	37	32	37	37	37	37	37
	11-7	22	22	22	32	22	22	22
MACHINE No. 2	7-3	39	39	39	39	39	39	32
	3-11	63	63	32	63	63	63	63
	11-7	36	36	36	36	32	36	36

EXPERIENCE at Spence Engineering Company, Inc., Walden, N. Y., indicates that 48 hours is the most practical work week. Not enough skilled men available for the 40-hour week, reports Paulsen Spence, president. Also, the men want the 8 hours' overtime. Furthermore, Spence experience leads to the belief that 48 hours is about all a man can stand.

The Spence shift schedule provides for 7 men to operate 2 machines, thereby giving the men 48 hours but operating the machines 168 hours a week. Six of the men are assigned to regular shifts; the seventh man pinch hits for the man who is off.

No attempt is made to provide each man with an equal number of Sundays off. Operator 44 is always off on Sunday, 37 on Monday, and so on. The spare operator, No. 32, doesn't work on Friday, is the only one of the men whose hours vary. He is on 8 hours, off 16, on 8, off 24, etc. The others, as already pointed out, work regular hours—No. 44 from 7 to 3, No. 37 from 3 to 11, and so on. They are always on 8 hours and off 16—with 40 hours off every seventh day.

SAMPLE SHIFT SCHEDULE OF GRAY PLAN

ON ▼ OFF ▼	1st WEEK S	M	T	W	T	F	S	2nd WEEK S	M	T	W	T	F	S	3rd WEEK S	M	T	W	T	F	S	4th WEEK S	M	T	W	T	F	S
4a.m.—Noon	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Noon—8p.m.	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C
8p.m.—4a.m.	C	D	A	B	C	D	A*	B	C	D	A	B	C	D*	A	B	C	D	A	B	C*	D	A	B	C	D	A	B

* This shift represents the sixth or "overtime" shift in this particular arrangement, which each man has one week in four

In the Gray Plan schedule reproduced on page 73 of March FACTORY, operator A was made to work a 16-hour stretch from 8 p.m. Monday to Tuesday noon. To make the plan work, the order of the shifts on the schedule should have been changed to 4 a.m. to noon, noon to 8 p.m., 8 p.m. to 4 a.m., as demonstrated in the schedule directly above.

The schedule works no matter when the shifts change. For example, for the shifts here shown, substitute midnight to 8 a.m., 8 a.m. to 4 p.m., 4 p.m. to midnight—and the schedule works as Messrs. Othmer and Lyman stated in their article. Similarly, one may substitute the 7 a.m., 3 p.m. and 11 p.m. starting times (as used in the Spence plan) and still get the same result.

FACTORY MANAGEMENT and MAINTENANCE PLANT OPERATION LIBRARY, No. 51 • MAY, 1942

How to Set Up a Suggestion Plan That Will Work

A. H. MOGENSEN, Consulting Editor, *Factory*

WE CAN APPROPRIATE BILLIONS for victory, but not one second of time. To win the war we must find new and better ways of doing every production job. We can find them quickest by going right to the more than 12,000,000 people in industry and encouraging them to submit their best time-saving and output-increasing ideas.

Employee suggestion plans are not new. They have been tried by hundreds of concerns. A few have been unusually successful. At RCA Manufacturing Company, to cite a single example, 20,000 employees in five plants sent in 36,872 suggestions during the first four months of that company's "Beat the Promise" campaign (March FACTORY, Part 2).

Other plans have survived even though a relatively small proportion of suggestions have been accepted.

But many have folded up. They have failed—mostly because there is something more to this business of setting up a suggestion plan than putting up boxes and providing paper and pencils.

Most Important Factor

First and most important, the top-ranking executive in the company must believe that his employees have ideas that are worth while, and everyone in the organization must *know* that he believes this, and that suggestions are wanted. Even though they are scattered all over the continent, the employees of United Air Lines know that Pres. W. A. Patterson means it when he says: "No suggestion is ever treated lightly, even though on the surface it may not appear to have merit." Most of them have heard him say this. As a result, the UAL Suggestion Bulletin for February listed 428 suggestions that were acted upon that month.

Association with thousands of workers in all sorts of factories, stores, offices, and banks has convinced me that two main fears block this all-important flow of ideas.

First, the employee feels that his idea may be taken by the boss as criticism. Most of the methods in effect are the ideas of some person now in a job above the one he held when he initiated the method or practice. When a suggestion for a better way to do the job comes along, he naturally takes the idea as personal criticism and turns "thumbs down." It is usually necessary, therefore, to conduct an educational campaign for foremen, supervisors, even executives, so that they will view every idea with an open mind. After this, an educational campaign is needed to convince the worker that the channel is now open and that his supervisor really wants his ideas.

Afraid of Supervision

Second, the employee feels that, if his idea has merit, his supervisor will tell him it won't work, or has been tried before, and then later put it in as his own.

Sometimes this is done, especially by assistant foremen and foremen, who think they can get away with it. Constant publicity and recognition of supervisors whose men turn in ideas will break down this practice.

Personally I do not believe in a suggestion committee. The better way is to have the suggestion plan run by one or more people (depending on size of plant) for whom it is a full-time job. Not that committees don't mean well. In most instances they are composed of busy executives who feel that the way to get ideas is to lend prestige by serving themselves. The first few meetings go off fairly well, but then it gets harder to call a meeting, or when one is finally called, many of the members are "tied up." This is especially true today, when most executives are carrying a double or triple burden of duties. And so the suggestions pile up.

Another thing, I insist on personal contact with the suggester—which excludes the plans based on identification by means of a number on the blank. This subject has been argued ever since I first heard about suggestion plans. Its proponents say that by keeping the identity of the suggester a secret no personal antagonisms or resentments can influence the decision. To me it seems that you are saying to your employees:

"We have a lot of small people around here, so to give you an even break just send in your idea unsigned, and no one will know it was you who put the idea in until the decision has been made."

If you have people like that in the organization, change their attitude by education. Don't foster it by setting up a system that sneaks ideas in by the back door.

Also essential is a definite award scale. Too many plans have died an untimely death through criticism caused by haphazard awards or prices. A flat rate like Merck & Company's 10 percent of the first year's saving (for details see page 76), or a sliding scale that increases the percentage award with a higher return on the investment is recommended.

"Shall we include foremen and supervisors?" This always starts an argument that can go on for days. My

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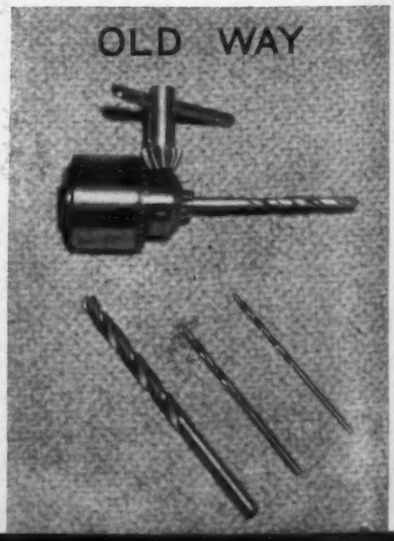
This idea submitted by Bud Mills at Vultee Aircraft, Inc., Nashville, promises to save upwards of $6000 a year by replacing a standard chuck with a special one, and by cutting down the time required to change drills. Below, a standard drill chuck, showing drill inserted and key in position to tighten or loosen chuck



advice is "Yes." Of course it should not be necessary to pay awards to foremen in order to get ideas. Of course it is their job. Of course that is what they are paid for. But experience in numerous plants has shown that, when they are included, many more ideas are received. Usual practice is to pay foremen 50 percent of the amount of the award that would have been paid had the idea come from a worker. Assistants, lead men, subforemen, and others in similar jobs usually get 75 percent.

A properly designed suggestion blank will have much to do with getting the right kind of ideas. Most blanks merely say "I suggest . . ." I have found that a higher proportion of accepted ideas will result if the blank has three spaces, marked "I suggest . . . I believe this will . . . I think this can be accomplished by . . ."

How It Will Work

This acts as an incentive for the suggester to tell how the idea can be put into effect, and what it will do. Naturally all blanks will not be completely filled out—but as time goes on more and more will come in with full information. This encourages the employee to think his idea through, and serves to eliminate many of the half-baked suggestions so common in many plans.

Suggestions must be acted on quickly. If there is to be any delay, the suggester should be kept informed by a progress report. Again it can be seen why I am such a strong advocate of having full-time investigators. These men need not be trained industrial engineers. They do not have to have the authority to make decisions. They do have to be the representatives of the employee to the management, and they should take the attitude that every idea is a good one until it is *proved* that it is not. Pleasant personality, ability to get along well with people and to talk the worker's language, no fear of hard work, an analytical mind, and an everlasting desire to get the facts—these qualifications are essential.

With a full-time man to run the suggestion plan, an investigation is quickly made and the award computed. It is then a matter of a few minutes only for an award board to pass upon the recommendation of the investigator. Contrast this with the usual suggestion committee meeting of harassed men who are asked to pass upon a folder full of suggestion blanks, none of which they have ever seen before and many of which merely say: "I suggest that we eliminate operation 25 on part X-2913."

Also essential is an adequate paperwork procedure. It is hard to find one that has been more carefully worked out than the Standard Register Company's which is described on pages 81 to 84. Every suggestion that involves any tangible savings should be worked out just as if it were a $10,000 project. A work sheet should be used and permanently filed that supplies full details as to present and proposed costs of materials and labor, estimated savings, and return on investment.

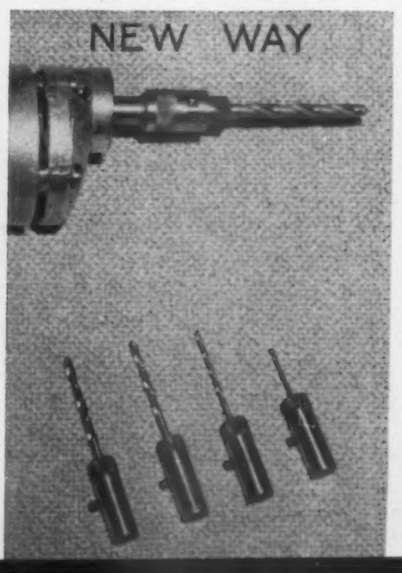
Good Publicity Pays

The value of professional-type publicity has been well demonstrated at RCA, Du Pont (Arlington, N. J.), and many other plants where unusually successful programs are in operation. Ballyhoo or advertising will not put over an unsound plan, but if the plan is right, the proper posters, payroll inclosures, letters from the head of the firm, adequate space in the company publication, or, better yet, a special monthly suggestion bulletin going to employees—all these aids will help convince everyone that the company means business.

If your company has no suggestion plan in effect, install one now. If it has a plan that produces less than 50 percent of accepted suggestions, check it against the essentials that have been outlined here and are described in the pages that follow.

In this way you can assemble the intelligence of your whole organization, and enlist it in the fight for production superiority. We must outstrip the forced manpower of the Axis powers by the brain power of the American worker. The ideas are there. Will you get them?

Below, the Mills chuck and adapter with drill inserted. Adapter is held in place by a spring and pin slot that prevents it from turning. Cost of chuck and adapter is $2.80; standard chuck costs $4.50. Center, operator uses new chuck on the Vengeance canopy. Spare drills, ready for use in adapters, within easy reach

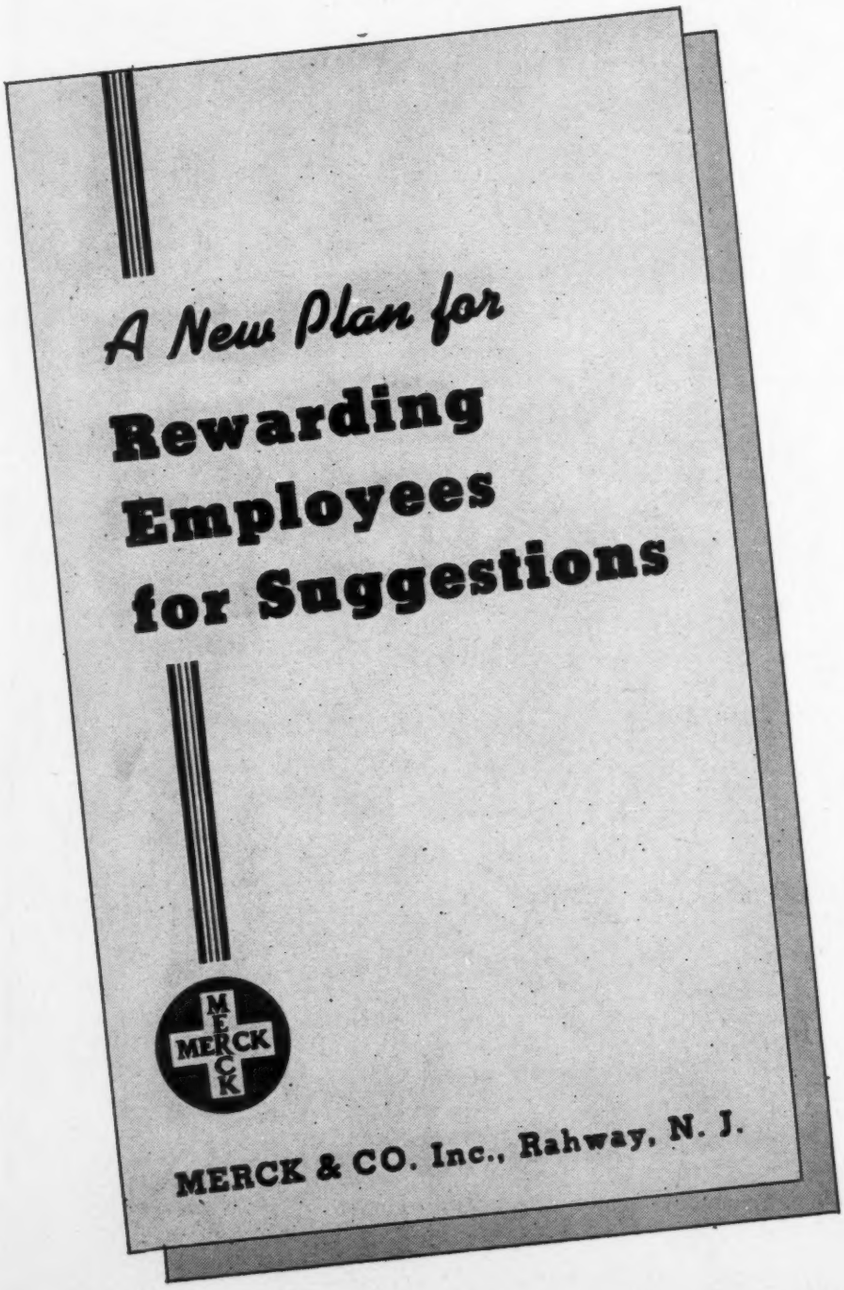


Presenting the Plan to the Employees

FORMAL ANNOUNCEMENT of the suggestion plan is necessary to insure enthusiastic acceptance by company employees. Everything must be set down in black and white. There must be no misunderstanding.

More and more concerns are therefore using the booklet method illustrated here. Of pocket size, the booklet is designed to be kept by the employee —and experience has shown that it usually is, most people being reluctant to throw away anything between two covers.

Note that the Merck & Company booklet lists kinds of suggestions that are acceptable, explains how to make a suggestion, tells the suggester what happens to his suggestion, and shows how rewards are figured.



Suggestion Plan

IN OUR WORK with Merck & Co. Inc., we have many common interests. One of the most fundamental of these is our interest in progress—of the Company as a whole, and of ourselves as individuals. To achieve progress, we must first *make the best possible use of all we know now,* and, secondly, we must *develop new ideas.* No organization or individual can survive without growing, and these principles are essential to growth. *"When we're through changing, we're through!"*

We need and want *new ideas.* To encourage you to submit them, and to reward you when they are acceptable, this new Suggestion Plan has been developed. Our aim is to eliminate all *waste* of *time, energy,* and *materials*—thereby improving the quality of our products, eliminating hazards and delays, and lowering costs.

For each practical suggestion you submit and which is put into effect, you will receive a cash reward in proportion to the value of the suggestion.

Type of Suggestions

Suggestions to be considered for rewards should contain ideas for:

Elimination of hazards

[1]

agement has acted upon your suggestion. In the case of unsigned suggestions, a notice will be posted on the bulletin boards adjacent to the Suggestion Boxes, describing the suggestion. The Suggester should then identify himself to the Industrial Engineering Department and, if the suggestion has been accepted, receive his Reward.

Rewards

Class 1-A. Tangible Savings

In figuring Suggestion Rewards, the estimated savings will be based on the production requirements for the previous twelve months' sales. Investment costs will be the total actual expenses.

Investment costs will be written off on a three-year basis. Therefore, Suggestion Rewards will be figured on *one year's savings less one-third of the investment cost.* This figure will be called the Net Savings.

The Suggestion Reward will be 20 per cent of the Net Savings on suggestions submitted by Direct and Indirect Operators, Clerks, and Inspectors.

The Suggestion Reward will be 15 per cent of the Net Savings on suggestions submitted by Foremen, Foreladies, and Mechanics.

The Suggestion Reward will be 10 per cent of the Net Savings on suggestions submitted by Department Heads, Assistant De-

[5]

Improving quality of products
Eliminating useless operations
Grouping or combining operations more effectively
Improving working conditions
Designs for tools, jigs, fixtures, or equipment
General layout, storage, and handling improvements
Simplification of operations
Design or construction of packages
Method improvements
More effective utilization of machinery
New production ideas
Savings of Time, Energy, or Material in any constructive way

Suggestion Forms

New suggestion forms have been prepared. These forms will be found in the Suggestion Boxes located throughout the Plant.

How to Make a Suggestion

Suggestions should include a definite proposal, telling *how* the improvement can be made. When you have considered your idea thoroughly, take one of the forms and describe it. Tell *what* your suggestion will accomplish and, so far as possible, *how* the improvement can be made.

The mere statement that a certain operation *can* be improved, or that a method or procedure is *wrong*, cannot be considered as a constructive suggestion.

You may sign your name or not, as you choose. We would like to have your name so that you may aid us in the development of your idea. However, if you prefer to withhold your identity until the suggestion has been investigated, you may do so. The suggestion form is addressed to the *Industrial Engineering Department*. It may be dropped in one of the Suggestion Boxes or in any of the regular mail baskets.

Your supervisor, or the Industrial Engineering Department, will gladly help you in expressing your idea clearly and concisely, or by answering questions relating to your suggestion.

If you can send samples, charts, sketches, or any other material along with your suggestion that will assist in investigating it, please do so.

Investigation of Suggestions

If you sign the suggestion form, you will be contacted as soon as possible by a member of the Industrial Engineering Department who will discuss the details of your idea with you.

The Industrial Engineering Department investigator will get all the necessary information together such as: sales figures; cost

and time-study data; installation estimates for new tools, jigs, equipment, or machines; new material cost, etc. He will combine your ideas with those of the supervisor of the department to which your suggestion applies (and all other interested persons) to be sure that the best improvement is developed from the suggestion. If the suggestion involves tangible savings, he will calculate present and proposed costs for material and labor, and annual savings. Finally, he will obtain and record the necessary approvals of yourself, the operating department involved, and the Sales Department, Purchasing Department, or Control Laboratory, if they are involved.

If your suggestion concerns a safety problem, it will be referred to the Safety Department and investigated by them.

Your suggestion will then be submitted to the Management for final consideration and classification under one of the following headings:

Class 1—Suggestion Acceptable

A. Tangible savings of material and labor.

B. Intangible savings.
Safety improvement.
Quality improvement.

Class 2—Suggestion not Acceptable

You will be notified by the Industrial Engineering Department as soon as the Man-

partment Heads, and Technical Staff Members.

Class 1-B. Intangible Savings

Suggestion Rewards will be determined by the Management. In setting the Reward, such factors as the importance of the resulting change and the amount of creative thought involved will be considered.

Class 2

Suggestions will be discussed with the Suggester by a member of the Industrial Engineering Department who will explain in detail why the suggestion was not accepted.

General

In all cases where suggestions are accepted, the minimum reward will be $2.00, and the maximum reward will be ***unlimited.***

Savings effected by employees as a result of their *regular duties* will not be considered for rewards.

It will be considered a routine duty of Department Heads, Assistant Department Heads, Foremen, Foreladies, Mechanics, and Industrial Engineers to set up all *new* jobs with the best possible method of operation. These set-ups are not eligible for rewards.

Also, it will be considered a routine duty of the scientific and engineering personnel

of the Research and Development Department to present ideas for new products and processes, and for the improvement of existing products and processes. Such suggestions are not eligible for rewards.

No credit will be allowed for improvements to operations which have obviously been set up carelessly. Where a method is accepted due to an emergency, with an improvement to be installed later, that improvement will not be eligible for a reward.

How to Figure Your Reward

$$\left(\text{Annual Savings} - \frac{\text{Investment Cost}}{3}\right) \times 20 \text{ per cent} = \text{Reward.}$$

Example 1: Operator John Smith suggests a change of method in producing a certain product. Investigation shows that the new method is satisfactory to all concerned, and that it will result in an annual saving of $150 in labor and $50 in material, making a total saving of $200. To put his suggestion into effect, a total investment of $75 in material and labor is necessary. His reward would be figured as follows:

$$\$200 - \frac{\$75}{3} = \$175 \times 20 \text{ per cent} = \$35$$

Reward.

Example 2: Forelady Jane Doe in the Packaging Department suggests a change in container for a certain product. Investiga-

tion shows that this change will save 50c per 1,000 in the cost of the container and 50c per 1,000 in the labor of packaging. Sales for the last twelve months amounted to 150,000 pieces so that the total saving is $150. In order to make the change, new dies must be purchased at a cost of $24. Her reward would be figured as follows:

$$\$150 - \frac{\$24}{3} = \$142 \times 15 \text{ per cent} =$$

$21.30 Reward.

Example 3: If, instead of Forelady Jane Doe, this suggestion had been made by a Department Head, the reward would have been 10 per cent of $142, or $14.20.

•

"The whole fun of living is in trying to make something better."

Charles F. Kettering

How GE Runs Its Suggestion Plan

WM. E. OWEN, Employee Suggestion Plan, General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC EMPLOYEES make several thousand suggestions a month. More than a third of them click. Since the inauguration of its suggestion plan 25 years ago, the company has paid out more than $1,000,000 in awards for workable ideas.

These remarkable results may be attributed to a suggestion system that was originally well conceived and worked out, and to an active company campaign designed to encourage workers to submit their ideas.

For the most part of a non-patentable nature, suggestions cover almost every phase of the company's activities from improvements in shop safety conditions to better sales cartons. The great majority, however, deal with improvements in manufacturing methods, conservation of materials, reduction of spoilage and waste, and improvement in the quality or design of apparatus.

The plan is intended primarily for employees not in a supervisory capacity, and about 95 percent of all suggestions sent in are from men and women employed in the shops, in most cases dealing with improvements on the suggester's own job.

Suggestions are mailed directly to the suggestion committee or dropped in one of the suggestion boxes. Each suggestion is promptly acknowledged, investigated, and usually answered in writing within two weeks. If the suggestion is not adopted, an explanation is given. Awards of $2 up are made for all adopted suggestions, the amount varying according to the value of the suggestion.

If a cost reduction is realized, a proportion of this reduction is given the suggester. No maximum award has been set, although the largest sum so far paid is $1500.

Awards Vary in Size

Even where an actual saving can be determined, the award varies in accordance with the ingenuity and effort required of the suggester. Obviously, a suggester who effects a cost reduction of several thousand dollars a year by substituting a punched part for a casting does not expend the same effort as one who, on his own time, evolves an ingenious device, even though the number required is not large.

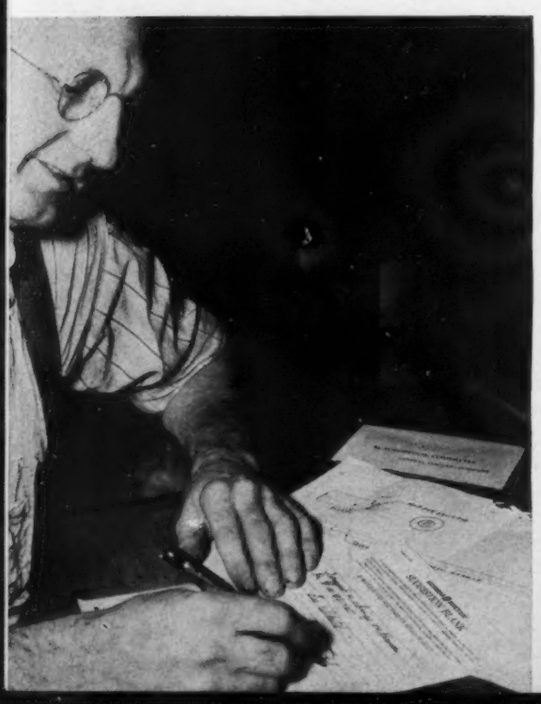
A great deal of care is taken to insure that each suggestion receives a thorough and impartial investigation; the suggester invariably feels that his suggestion is a good one and should be adopted. Consequently, if the investigation shows that it would not be practicable to adopt it, the suggester is fully informed of the reasons. Most suggesters are satisfied when a logical reason is given them for turning down their ideas. A few, however, appear to be disappointed or discouraged; in such cases, the committee makes every effort to point out that the suggestion has been fairly considered. Occasionally the suggester may bring up some point that has been overlooked in the investigation, and in such cases a reinvestigation is always made.

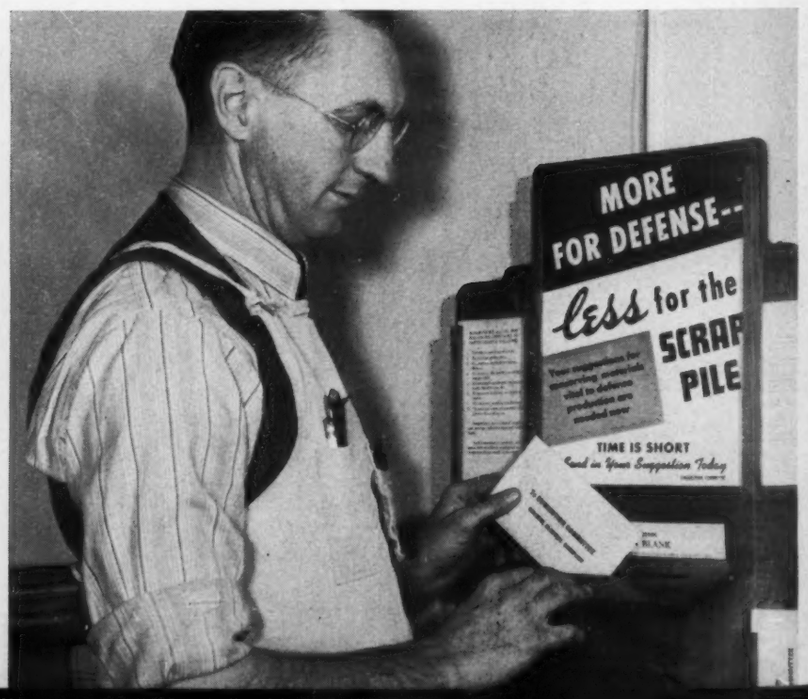
When first started, the suggestion plan met with opposition from a few men in a supervisory capacity who felt that suggestions from people under them reflected on their ability. Removing this feeling was a long and difficult task. At every opportunity the management made it clear that all supervisors should encourage suggestions from their men. Each suggestion was handled carefully so as not to antagonize the supervisor, even though the suggestion disclosed that he might have been negligent in some respect.

Opposition on the part of the supervisors gradually diminished, and at the present time it is the general feeling that the most efficiently run de-

1. Clifton Crounse of the tool department notices that a certain type of reamer is made entirely of expensive high-speed steel. The shank and handle could be made of cheap cold-rolled steel. Crounse fills out a suggestion blank and sketches his idea

2. Crounse inserts blank and sketch in suggestion envelope, deposits it in nearby box. Poster typifies methods used to encourage suggestions. Listed at left of poster are types of suggestions wanted; right, a note to shop people invites suggestions

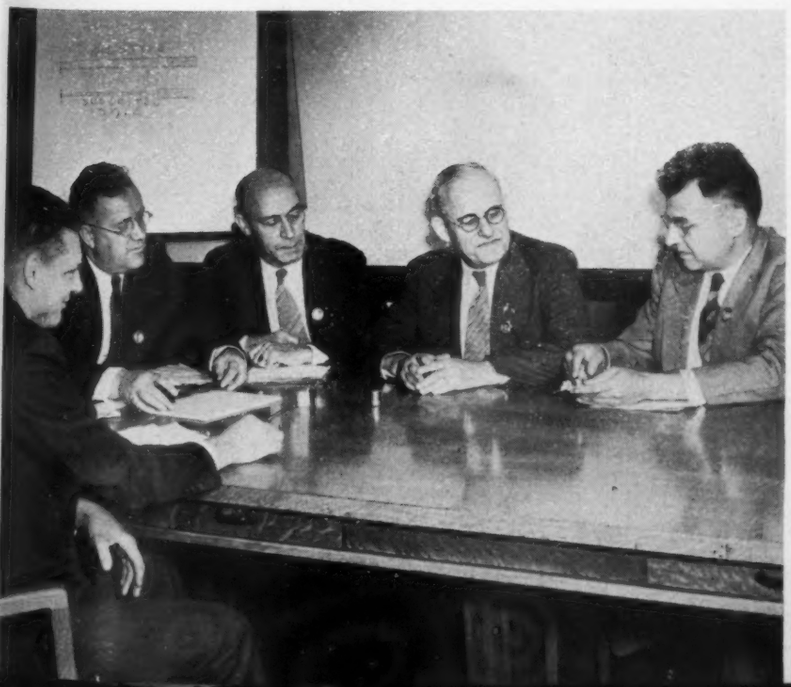




3. Suggestion is promptly acknowledged. Shortly thereafter a representative of the suggestion committee calls on Crounse at his job in the tool department and discusses the idea in detail

4. Committee meets at least once a week. At the Schenectady Works it is composed of the general superintendent, the assistant to the manager in charge of engineering, and certain members of the manager's staff. Crounse's idea is accepted

5. Crounse is happy. Why not? He gets a substantial check from his department superintendent. His photograph, an outline of his suggestion, and the amount of his award will be in the *Works News*. Local newspapers will also carry a story



partments are those turning in the most suggestions.

In the early days it was also difficult to get employees to make suggestions. There was a feeling that their suggestions might be resented by their foremen and that sooner or later they would find themselves subject to discrimination. This feeling has practically disappeared. In fact, employees now frequently enlist the cooperation of superiors in attempting to make their suggestions successful.

It was our early experience, too, that many of the suggestions submitted had very little connection with our company's business. All sorts of gadgets and schemes were proposed. However, by constant education, employees have been trained to confine their suggestions to manufacturing and design problems.

One valuable phase of our suggestion plan is the opportunity it affords to discover talent that might otherwise remain hidden. Many excellent mechanics have been discovered through their ability to make constructive suggestions. In one of our plants, where a large number of our new foremen have recently been appointed, 75 percent of them had made an average of 10 suggestions each while working on the bench.

A suggestion system cannot be left to run itself. We have found that advertising posters placed on suggestion boxes and bulletin boards, and changed at frequent intervals, are an excellent way to remind employees of the suggestion system.

Stimulating the Flow

Probably the best medium for stimulating a constant flow is a works magazine or paper. Each week there appears in our works paper a list of successful suggesters with photographs, outlines of their suggestions, and the amounts of their awards. This seems to act as a spur, particularly to those who know the suggesters. Also, stories on awards are frequently run in local newspapers.

Occasionally an employee requests that we handle his suggestions without divulging his identity. It is the practice of the suggestion committee to respect his wishes in this regard.

One might think that after a suggestion system has been in effect for years there would be a gradual drop-off in the number of suggestions submitted. This, however, has not been true at General Electric. As a result of research and engineering, new products are constantly being introduced and present lines redesigned, thus opening up new opportunities for the suggester. Bearing out this statement is the fact that the number of suggestions submitted each year has shown an average increase of approximately 10 percent over the previous year.

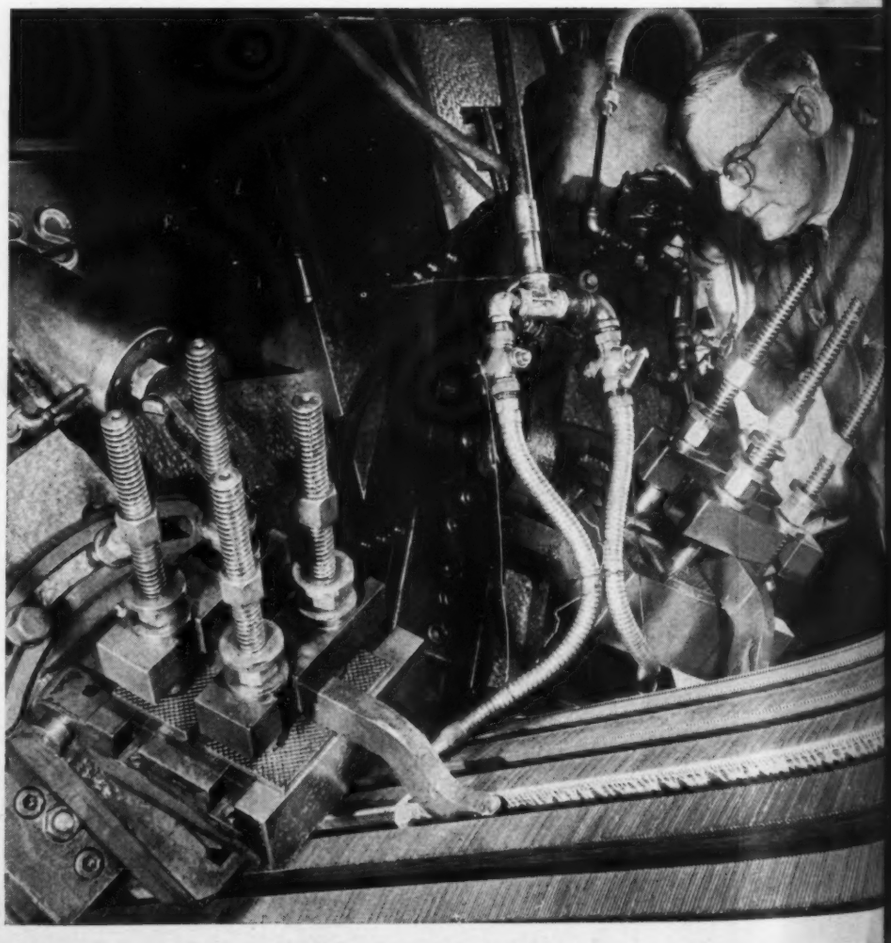
The reduction in manufacturing costs through suggestions aggregates a large sum. As it is company policy to pass along to the customer the savings brought about by improved methods, it is apparent that this suggestion plan is an important factor in the steady decrease in cost of electrical products. Thus we see that good, workable suggestions represent a "bonanza" not only for the employer and the employee, but also for the user, who thereby gets better equipment at lower cost.

Westinghouse Paid $750 for This

A 62-YEAR-OLD MACHINIST'S idea for doing his job 40 percent faster and eliminating tool breakage earned him $750, the largest of the 2186 awards paid by Westinghouse Electric & Manufacturing Company in 1941 for suggestions accepted from employees at the East Pittsburgh works.

The winner, Albert Bachofer, a veteran of 41 years' continuous service, is shown operating a steel cutting tool as it grooves slots in a 14-ton rotor for a large electric power generator. The slots in the steel cylinder are for the insertion of coil windings. He suggested a compressed air device which automatically lifts the tool above the cut while the 14-ton rotor glides back in preparation for another cutting stroke. Formerly the tool was dragged through the fresh cut on the backward stroke.

The number of suggestions accepted in 1941 was 22 percent ahead of 1940. The company paid $15,998 for these ideas, a 24 percent increase over the previous year. More than 84,000 have been submitted since the introduction of the suggestion system in 1910. Awards to successful suggesters are based on the first year's net saving.



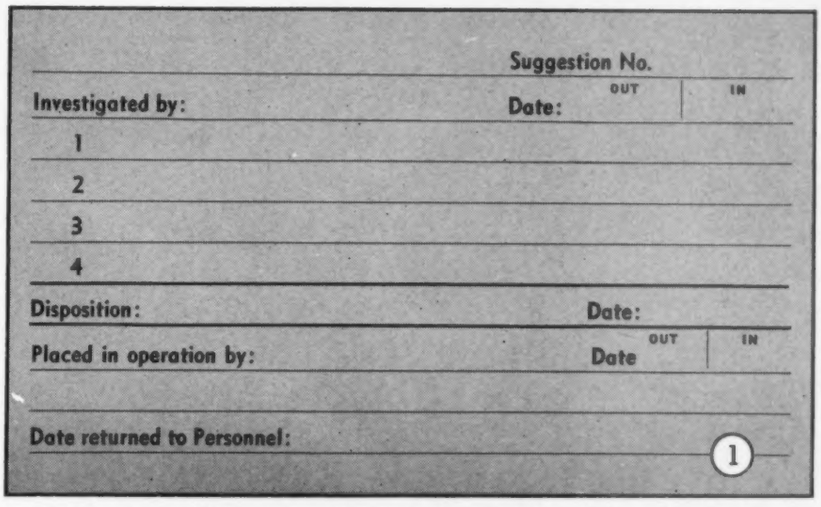
Here's the Paperwork Needed for a Good Suggestion Plan

P. L. SCHNEIDER, Vice-President, The Standard Register Company, Dayton

ANYONE WHO KNOWS WHAT WE MAKE would expect to find good paperwork in our plant. After all, forms are our business—and we have always been mighty careful to see that the old saw about the shoemaker's children did not apply to us. Yet that explains only in part why we have given so much thought to the paperwork connected with our suggestion system. It's not because we are in the forms business. It's because 20 years' experience has taught us that a suggestion system is no better than the paperwork set up to make it function.

Don't jump to the conclusion that ours is an elaborate system. Actually, we think we have stripped it down to the least possible number of forms.

The forms are shown here in the order of use—except for Figure 1 which is a 3x5 card designed to help the suggestions clerk follow up the investigating committees.


Suggestion No.

Investigated by: Date: OUT | IN

1

2

3

4

Disposition: Date:

Placed in operation by: Date OUT | IN

Date returned to Personnel:

1

A 3x5 card enables suggestions clerk to follow through and prevent unnecessary delays. On the following pages, complete paperwork that keeps Standard Register's suggestion plan from bogging down

When an employee has a suggestion to make, he writes it up on a blank (Figure 2), places it in an envelope (not shown) addressed to the general manager, and deposits it in one of six locked boxes in the plant. Suggestions are picked up once a week, assigned numbers, and typed (Figure 3), a copy going to the general manager. This sheet contains name of suggester and number of suggestion. It is filed numerically. Stub at bottom of original suggestion blank, showing name of suggester, is torn off and placed in a confidential file.

At the same time the clerk types a short description of the suggestion on a record sheet (Figure 4) which is kept for each suggester. Record sheets are filed alphabetically.

Next the clerk sends a letter of acknowledgment (Figure 5). This is important. The suggester always thinks he has a big idea, and should know that it is getting prompt consideration. Note that the letter is signed by the general manager.

The clerk now makes up a folder (Figure 6) for each suggestion. In it is the original suggestion minus the bottom stub (Figure 2). Folder is sent to the investigating committee, whose chairman assigns the suggestion to the foreman or department head who is most closely affected or concerned. A factory investigating committee handles suggestions made by factory employees; an office committee, those made by people in the office. The foreman investigates promptly and makes his recommendation on a report sheet (Figure 7). Note that the investigator does not know the suggester's name.

Folder is now returned to committee, which accepts or rejects, and sends folder back to suggestions clerk. Stub is pulled from file and attached to folder. Notations are made on record sheet (Figure 4) and on duplicate (Figure 3) of original suggestion.

A follow-up sheet (Figure 8) is now placed in the folder, which is sent to the investigating committee, which in turn forwards it to the foreman or department head who is to put the suggestion into effect.

Folders are held until the end of the suggestion contest, at which time accepted suggestions are considered for major awards.

Our contests begin on July 1 of each year. In addition to the award for each accepted suggestion, 30 major prizes are distributed at the end of each contest period. In the last contest we received 488 suggestions (from approximately 800 employees at that time), more than half of which we were able to adopt.

If an employee makes five usable suggestions in a given year, he becomes a member of the Standard Improvement Club. To stay, he must have at least one suggestion accepted in each subsequent period. Otherwise he is automatically out. As soon as an employee has 20 suggestions accepted, he becomes a permanent member of the club. The five major prizewinners also become members for the ensuing year. The winner of the $200 award gets his name inscribed on a silver plaque which hangs in our lobby.

We have found that a constant effort must be made to stimulate the flow of suggestions. So we revamp our system every few years and start all over again, each time concentrating on some new method of getting employees interested and letting them know that the management is interested in getting their ideas. We know our plan works. We think much of its success may be attributed to the system of paperwork described here. And now that you know our story, we wonder if you won't agree.

CONTINUED ON NEXT PAGE

SUGGESTION-PLAN PAPERWORK (continued)

THE STANDARD REGISTER COMPANY

EMPLOYEES' SUGGESTION CONTEST

PRIZES!

Suggestion No. _____ (LEAVE BLANK)

To MR. M. A. SPAYD, Executive Vice Pres. and Gen. Mgr. Date _____

I suggest that _____

(2)

(BE SURE TO SIGN YOUR NAME, CLOCK NUMBER, DEPARTMENT AND DATE)

Name _____

Department _____ Sug. Used in Dept. _____

Clock No. _____

Date _____

THIS COUPON TO BE DETACHED AND KEPT IN CONFIDENTIAL FILE

Suggestion No. _____ (DO NOT FILL IN)

INSTRUCTIONS

Make only one suggestion on this form. Submit sketches. If suggestion requires, on separate sheet. Sign and date all suggestions as well as sketches before dropping in Suggestion Box.

(3)

EMPLOYEES' SUGGESTION

Name of Suggestor _____

Description of Suggestion:

Date Received in Suggestion Office

Date of Acknowledgment

Date Sent to Investigator (Name _____

Date Submitted to Awards Committee

Decision of Awards Committee

Report of Investigating Committee

Amount Awarded

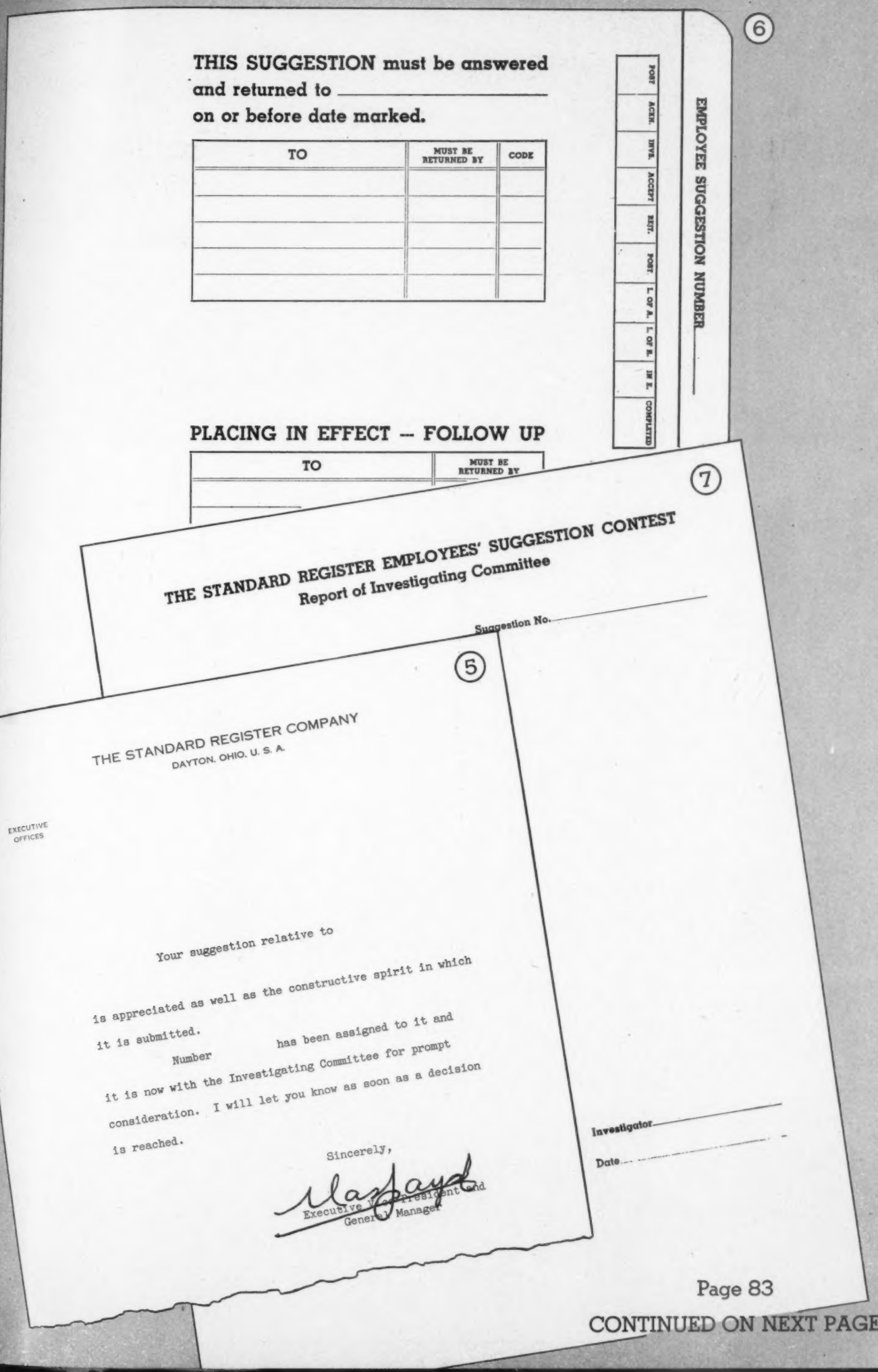
Date Notified Suggestor of Disposition of His Sugge

(4)

THE STANDARD REGISTER EMPLOYES' SUGGESTION CONTEST.

Dept. _____ Name _____

Description	No.	Est. Savings	Installation Cost	Amount of Award	Actual Savings



⑥

THIS SUGGESTION must be answered and returned to _____ on or before date marked.

TO	MUST BE RETURNED BY	CODE

POST | ACKN. | INVS. | ACCEPT | REJ. | POST. | L. OF A. | L. OF R. | IN E. | COMPLETED

EMPLOYEE SUGGESTION NUMBER_____

PLACING IN EFFECT -- FOLLOW UP

TO	MUST BE RETURNED BY

⑦

THE STANDARD REGISTER EMPLOYEES' SUGGESTION CONTEST
Report of Investigating Committee

Suggestion No._____

⑤

THE STANDARD REGISTER COMPANY
DAYTON, OHIO, U. S. A.

EXECUTIVE OFFICES

Your suggestion relative to

is appreciated as well as the constructive spirit in which it is submitted.

Number has been assigned to it and it is now with the Investigating Committee for prompt consideration. I will let you know as soon as a decision is reached.

Sincerely,

Executive Vice President and General Manager

Investigator_____

Date_____

CONTINUED ON NEXT PAGE

SUGGESTION-PLAN PAPERWORK (continued)

⑨

FOLLOW-UP FROM INVESTIGATING COMMITTEE

Employes' Suggestion Contest

To: _____

Date _____
Suggestion No. _____
Suggestion Dated _____

The following suggestion has been accepted and is referred to you for putting into effect. Please sign and return **as soon as** this suggestion has been **made** effective.

DESCRIPTION OF SUGGESTION:

THE ABOVE SUGGESTION RELATIVE TO MY DEPARTMENT IS NOW IN EFFECT

Date _____

Signed _____

Department _____

Comments

⑧

THE STANDARD REGISTER CO. EMPLOYEES' SUGGESTION CONTEST

Suggestion No. _____

Mr. _____

_____ 19 _____

Dept. _____

The attached suggestion is referred to you for investigation. Please investigate as soon as possible, answering all questions below and adding such additional information that will assist the Committee in deciding the value of the suggestion.

SUGGESTION CONTEST COMMITTEE

_____

_____

Date suggestion was received in Suggestion Office _____

ANALYSIS

	Material	Labor	Overhead	Total
Present Cost				
Est. Cost after Change				
Saving -- Increase				

New equipment or tools required

Change of equipment or tools necessary — Est. Cost _____

Value of material on hand _____ Est. Cost _____

If estimates are not available do you recommend a tryout? _____ On Commitment _____

Yearly Production — Yearly Savings _____

Foreman's signature where suggestion will be used _____

Effective date for suggestion to be in operation _____

Briefly state reasons for adoption or rejection _____

_____

_____

_____

Investigator's Signature _____ Date _____

Not shown are two letters – one of acceptance, the other explaining why the suggestion was turned down. These letters, like the acknowledgment (Figure 5), are signed by the general manager. One or the other goes to the suggester as soon as final disposition has been made of his suggestion

All available space, especially shelves under subassembly benches, is being used for storing parts where they are needed. Stock chasers see that supplies of parts are replenished at regular intervals

How We Doubled Production

Part II. Three of the four methods used to increase production were outlined in April: (1) Standardizing parts; (2) rearranging equipment; (3) simplifying production. The fourth, developing a production control system, is described here

P. A. ABE, Vice-President of Engineering and Production, The Monarch Machine Tool Company, Sidney, Ohio

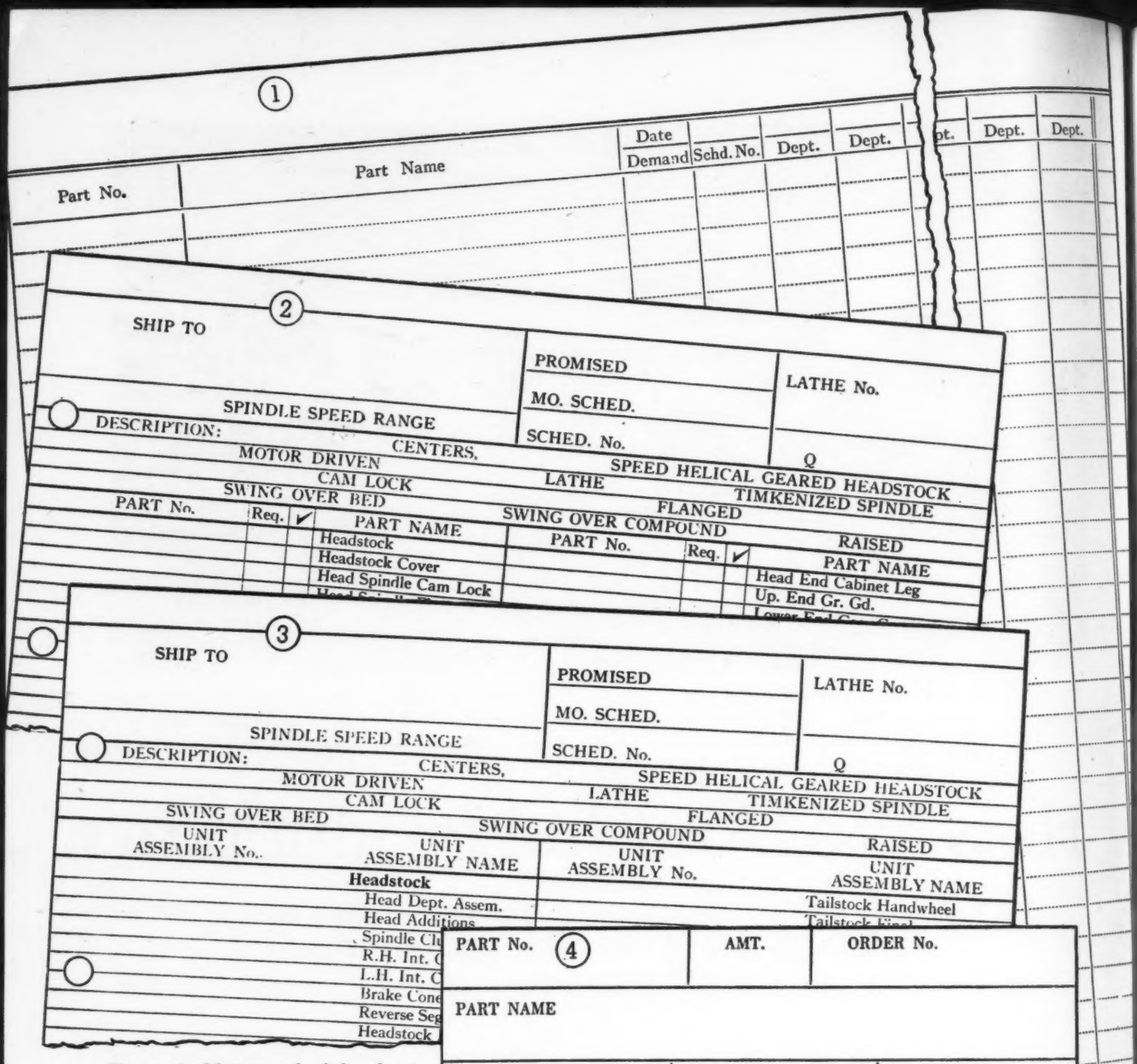
PROBABLY NO SINGLE function in the operation of a plant today is under such strain as its production control system. After all, it is of little use to increase the production of parts essential to the finished product if those parts are not kept moving smoothly and swiftly through the plant, into assembly, and out the shipping door.

At Monarch we are turning over our inventory of material and parts several times a year. On the large pieces such as lathe beds, our inventory is, of course, in a constant state of turnover. The use of manufacturing space for stock storage is held to an absolute minimum and all possible emphasis put on keeping parts moving.

Since January 1, 1941, we have averaged 1,464,000 pounds of castings alone a month. Currently this is running at the rate of 1,750,000 pounds a month.

The heart of the production control system that keeps things moving for us is a master schedule sheet (Figure I) in the production control head's office. This sheet shows the serial number and size of all lathes as ordered. And if the heart of our production control system is in the scheduling office, it is no exaggeration to say that its "legs" are out in the plant—in the shape of a group of individuals known as stock chasers. These men, eight on the day shift and seven on the night shift, maintain a constant check-up on parts in process, keep replenished the supplies of parts in assembly and subassembly departments, expedite special jobs, and regularly follow one or more types of material or parts from delivery to use.

It has been found more economical in many respects to use more men than to tie up more inventory. This is particularly true, of course, at the present time when getting out production is the all-important thing. The system of stock chasers was inaugurated about five years ago. In many respects it has contributed more than any other single thing to the smooth functioning of our system of production control. It is doubtful whether, with an increase in plant area of only 25 percent in the last three years, it would have been



① Part No. | Part Name | Date Demand | Schd. No. | Dept. | Dept. | Dept. | Dept.

② SHIP TO | PROMISED | MO. SCHED. | SCHED. No. | LATHE No. | Q

SPINDLE SPEED RANGE
DESCRIPTION: CENTERS, SPEED HELICAL GEARED HEADSTOCK
MOTOR DRIVEN LATHE TIMKENIZED SPINDLE
CAM LOCK FLANGED
SWING OVER BED SWING OVER COMPOUND RAISED

PART No.	Req.	✓	PART NAME
			Headstock
			Headstock Cover
			Head Spindle Cam Lock

PART No.	Req.	✓	PART NAME
			Head End Cabinet Leg
			Up. End Gr. Gd.

③ SHIP TO | PROMISED | MO. SCHED. | SCHED. No. | LATHE No. | Q

SPINDLE SPEED RANGE
DESCRIPTION: CENTERS, SPEED HELICAL GEARED HEADSTOCK
MOTOR DRIVEN LATHE TIMKENIZED SPINDLE
CAM LOCK FLANGED
SWING OVER BED SWING OVER COMPOUND RAISED

UNIT ASSEMBLY No.	UNIT ASSEMBLY NAME
	Headstock
	Head Dept. Assem.
	Head Additions
	Spindle Cl
	R.H. Int. C
	L.H. Int. C
	Brake Cone
	Reverse Seg
	Headstock

UNIT ASSEMBLY No.	UNIT ASSEMBLY NAME
	Tailstock Handwheel
	Tailstock Finel

④ PART No. | AMT. | ORDER No.

PART NAME

AMT. SHORT | FOR MONTH | SCHEDULE No.

INSPECTED BY	ROUTE	DEPARTMENT	DEPARTMENT	ROUTE	INSPECTED BY
		CLEAN AND PAINT	SAWS.....	1	
		MILL.....	LATHE.....	2	
		MILL.....	LATHE:.....		
		PLANER.....	LATHE.....		
		DRILL.....	GEAR.....	3	
		DRILL.....	GEAR.....		
		DRILL.....	GRIDLEY.....		
		TOOL ROOM.....	GRIDLEY.....		
		SCRAPE ASSM.....	GRINDER.....	5	
		HEAD ASSM.....	GRINDER.....		
		CASTING SHED....	CHROME.....		
	4	HEAT TREAT.....			
	6	CLEAN BENCH.....	STOCKROOM.....	7	

INSPECT ALL PARTS BEFORE LEAVING DEPARTMENT

Figure 1. Master schedule sheet is the heart of the control system. It shows the serial number and size of all lathes ordered

Figures 2 and 3. As soon as the information on these two forms reaches the production control department, operations are set in motion which bring materials and parts together at the proper time and place

Figure 4. Route Card accompanies parts in process. It is kept on the foreman's desk during operations, and carries a yellow ticket if last requisition for parts left no more than an equal number in stock. If last requisition could not be filled, a red "rush" stamp calls attention to this fact

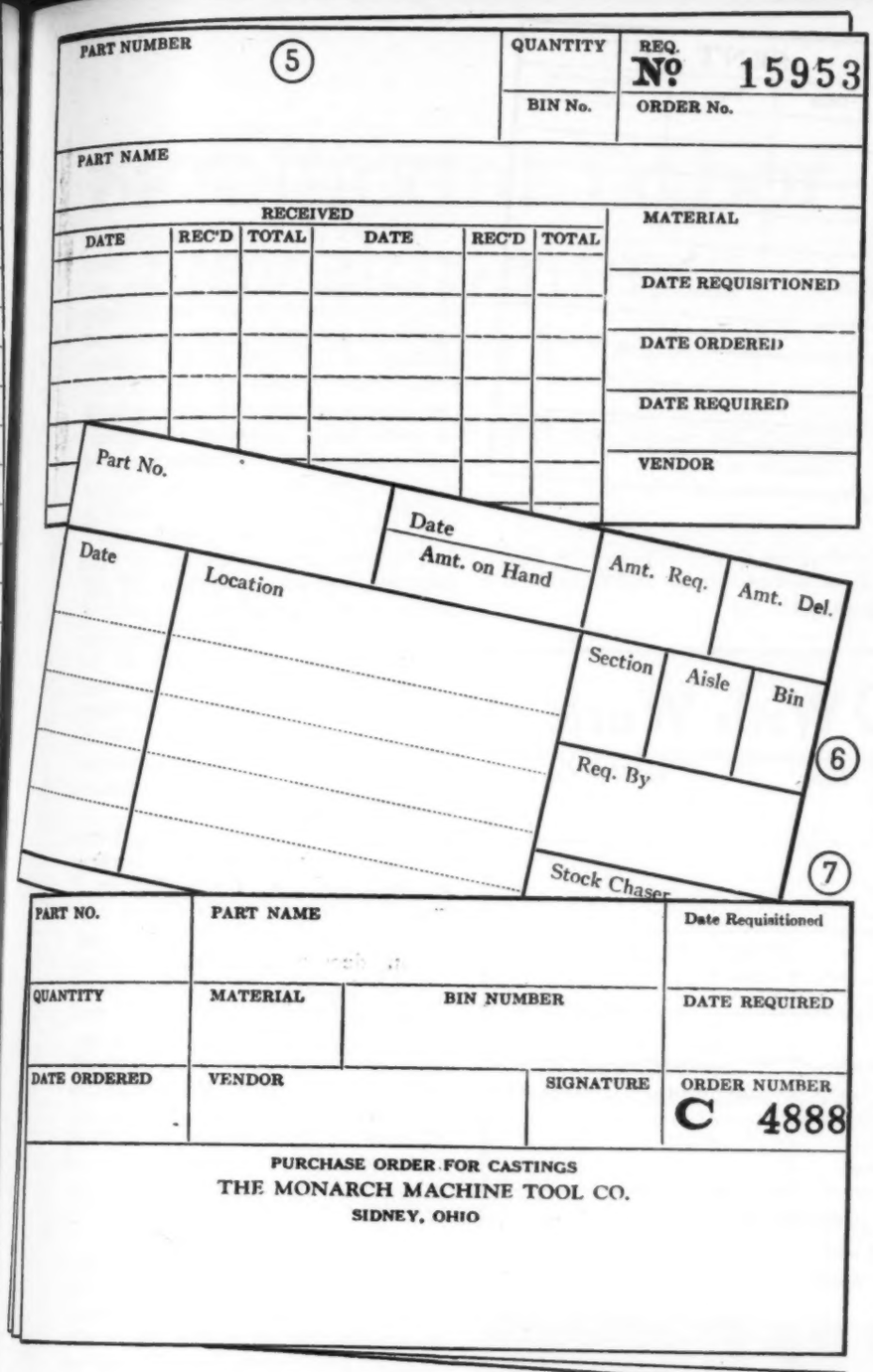


Figure 5. Made out in duplicate, this card calls for supplies handled through the company's regular purchasing departments

Figure 6. A simple white form is used by the stock chasers to initiate the flow of parts to the assembly department

possible to double production had it not been for this personal follow-up by individuals trained to expedite manufacturing operations.

Our day shift now consists of 845 men. The night shift has 569 men. To keep the necessary materials moving to the machining and finishing departments, and from them to the assembly and subassembly lines, is an assignment of no small proportions. Standardization of materials and parts, grouping of related operations, and simplification of individual jobs have all contributed to stepping up the volume of production to the point where serious bottlenecks could easily result if there were not equally good coordination of *all* operations in the plant.

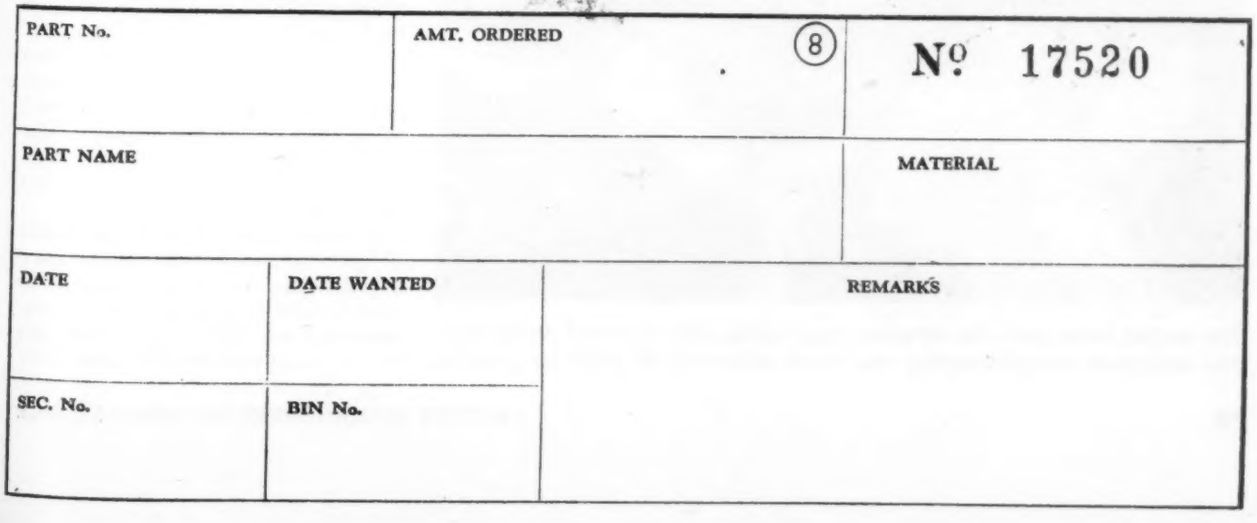
As much as possible, quantities of finished parts kept on hand have been decentralized, with storage at points of use as far as practicable.

Keeping inventory moving, and running parts only as actually required, releases floor space for other purposes. All available space, especially in shelves under subassembly benches, is being utilized for storing parts where they are needed. These supplies of parts are replenished at regular intervals under the direction of the stock chasers, who are thus in a position to know when it is time to start orders for more parts through the necessary machining and finishing operations.

Parts orders are always issued for unit quantities. This makes for a more balanced production in the manufacturing departments, keeps in-

Figure 7. Made out in triplicate, for ordering castings only. Sufficient quantities are ordered at one time to supply operations for a predetermined period

Figure 8. Used only in ordering steel, forgings, or bar stock from stock. A Routing Card accompanies this form to specify destination of the order



(9)

Amt.

Part No.

Part Name

Do Not Delay This Order

RECEIVED			SENT OUT		
Date	Time	Department	Date	Time	Signature of Foreman

The Above Foremen Will Not Delay These Parts

When Finished Send to Stock Room

Authorized by

Figure 9. Called an Arrow Card because of the big arrow printed on its back, this card appears only when it is necessary to move parts out of routine handling and rush them through

(10)

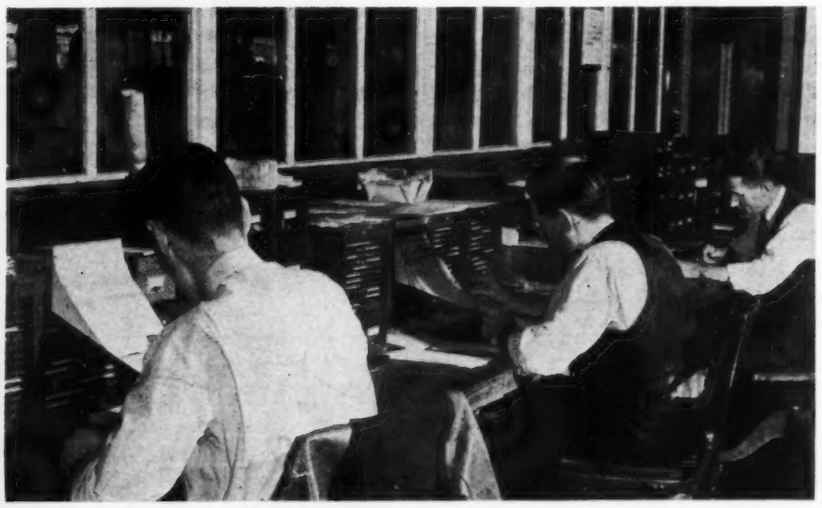
Keep Tag ○ With Work

Card No.	Amount	Size	Order No.

Unit Name

Unit No.	Date	Sched No.	Lathe No.
Shortage			
(over)			

Figure 10. This form is known as a Shortage Card, and is used for withdrawal from stock of parts not standard. Items that can be supplied only in part are so indicated under the "shortage" heading



No matter how good the system, production control won't work without adequate record-keeping and close follow-up of parts in process

dividual stockbins replenished, and provides a minimum reserve supply for central storage.

The stock chasers divide up the job of following through on certain kinds of parts. One man makes it his primary responsibility to see that the right lathe beds get on the right planers and grinders at the right time. Another stock chaser follows up small screw-machine parts. A third keeps track of quick-change gearboxes and aprons. Still another looks after certain sizes of forgings, and so on. In this way we are able to keep close tab on work in process throughout the entire plant.

The paperwork required to keep the production control system at full efficiency is not, fortunately, so great as might be expected. Here again considerable credit can be given to the use of stock chasers, who through their personal follow-up of inventory throughout the plant keep material flowing at a rate that precludes the need for any appreciable amount of record keeping.

Complete information on parts and on unit assemblies is brought together on two 8½x11-in. sheets (Figures 2 and 3), which accompany every new order as it is delivered from the engineering department to the production control department. Information on these two forms is supplied by a special-attachments engineer and a jigs, tools, and fixtures engineer. Immediately it is received in the production control department, the necessary operations are set in motion throughout the plant for bringing together at proper intervals the materials and parts required for the assembly of the finished job.

A Route Card (Figure 4) accompanies all parts in process. It is kept on the foreman's desk during operations in his department. If the last requisition for these particular parts left no more than an equal number in stock, a supplementary yellow warning card is clipped to it. If the last requisition for parts could not be filled in full, or left less than minimum number of parts in stock, a red "rush" stamp is used on route card to expedite handling.

Supplies of a general or special character are handled through the company's regular purchasing department, using the card shown in Figure 5. This card originates with either the engineering department or the production control department.

A simple white form, 4½x2½ inches (Figure 6), is used by the stock chaser to initiate the flow of parts to assembly departments. In general, parts are requisitioned in uniform predetermined

(*Continued on page 208*)

Significant Labor Developments

Period surveyed: February 10 to April 10

TREND INDICATORS

Wage Hour Administrator Limited

THE UNITED STATES SUPREME COURT ruled that the Wage Hour Administrator may not delegate to subordinates his power to subpoena. (Cudahy Packing Company of La. vs. Holland; Holland vs. Lowell Sun Company.)

Management Responsible for Its Agents

The influence of the Supreme Court's interpretations of the Wagner Act is being manifested by their application to State Acts. Formerly the Pennsylvania Supreme Court held that management cannot be held liable for the action of supervisory officials in interfering with organizational rights of employees unless such action was authorized by it. In view of the United States Supreme Court's interpretation of the Wagner Act, the Pennsylvania Court now rules that the burden is on *management* to disavow its agents' activities. (Hudson Motor Company.)

Blacklist for Falsification of Records

Proof that the public Contracts Administrator intends to show no leniency to violators of the Walsh-Healey Act is evidenced by his insistence that the blacklist penalty bars the award of further government contracts for a period of three years. The failure to keep true and accurate records, said the Administrator, shows a gross disregard for the requirements of the Act and involves fraudulent conduct sufficient to offset any hardship caused to employees by loss of work.

No Double Recovery for Overtime

An employee who works in interstate commerce may not recover for overtime under both a State Act and the Federal Fair Labor Standards Act. In such case the State Act has no application and the Federal Act controls, since Congress, in enacting the federal law, occupied the field of labor relations in interstate commerce and the state no longer has power to deal with the subject. (Sirmon vs. Cron and Gracey Drilling Corporation.)

Extreme Interpretation of "Interstate"

A producer who sells his goods entirely within the state must comply with the Wage Hour Act if such goods are "steadily and directly" shipped into other states by the purchaser, even though he is unaware of the ultimate interstate destination of his goods. (Cullum vs. Stevens.)

"Purge" Saves From Walsh-Healey Blacklist

An aviation company was relieved of the blacklist penalty for violations of the Public Contracts Act when it completely divested itself of its former ownership and control.

Federal Agency Establishes Labor-Management Board

The War Shipping Administration announced the establishment of the first efficiency board representing management, labor, and government. This is the outgrowth of a ruling by the Arbitrator under a contract between the shipping companies and a CIO union holding that he did not have power to order such a plan on the request of the union.

Continued Bonus May Be Compulsory

Granting a customary wage bonus may create the moral obligation to continue the bonus, despite the fact that it was accompanied with the notice that it was a gratuity which the employer might discontinue. The result: Although the employer granted a wage increase, it was bound to continue the bonus. (Parker Appliance.)

WAR LABOR BOARD

** WLB Limits Its Jurisdiction*

The War Labor Board is not concerned with all disputes. Accordingly, a rail dispute over adoption of standard working rules was sent to the National Mediation Board with the instructions that the parties agree to have the controversy arbitrated under procedure established by the Railway Labor Act. In another case a wage dispute between a city and a union was returned to the city authorities as sufficiently qualified to dispose of it. The Board did, however, order Federated Fishing Boats of New England and New York to procure war risk insurance for the crews of its boats under penalty of invoking President's War Powers.

** WLB Accepts State Court Ruling*

Further proof that WLB does not intend to take cognizance of disputes outside its realm is the recent ruling under which it deems itself bound by a state court's opinion. The case involved the validity of a closed shop agreement. The state court determined that there was no company domination or coercion of the AFL local gaining the closed shop. Until the case is reversed on its merits by an appellate court, WLB ruled the aggrieved local (CIO) cannot appeal for relief to the Board. The Board, however, did hold that employees who had been dismissed for failure to join the AFL local are entitled to reinstatement if they conform to the provisions of the closed-shop agreement.

Wage Differential Ruling Sets Precedent

In a significant ruling, WLB decreased the North-South wage differential in the plants of the Aluminum Company of America and granted a wage bonus to night workers in one of the company's plants. The company acceded to the majority decision under protest. Precedents:

1. A moderate premium is established for workers on night shifts.

2. Ability to pay should be taken into account as a factor in setting wages when the employer is able to pay more than the minimum standard of health and decency.

3. Better paid workers should not expect the wage level to keep pace day by day with the increase in the cost of living.

** WLB Bans Escape From Contract*

There is one type of dispute, said WLB, which it will not consider. It is that type in which a change of wage rates is sought by one party when there is an existing agreement

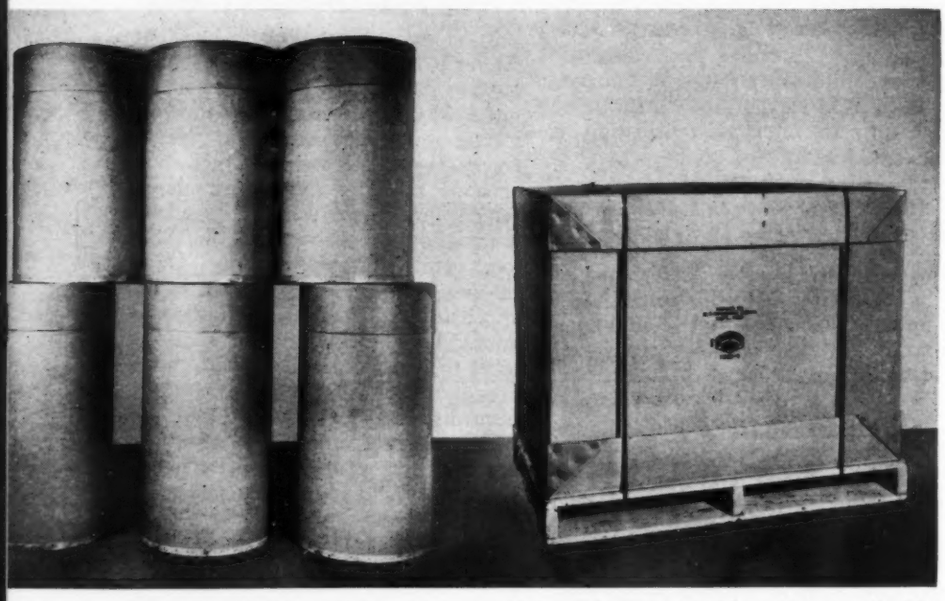
(*Continued on page 212*)

In this and the following classification items marked with an asterisk also are considered to be trend indicators.

Our Goal for 1942: A Million

When OPM said, "Cut 1942 cardboard consumption 25 to 33 percent," Goodrich went to work on package styles, eliminated unnecessary carton sizes and models

LeROY HOSTETLER, Superintendent, Factory Service Division, The B. F. Goodrich Co., Akron



Corrugated box strapped to pallet replaces six fiber drums, holds 1800 pounds of Koroseal, saves 208,800 pounds of board annually

Individual cartons for garden hose give way to bulk packaging, five to a box. Should save 27,770 pounds of board in 1942

JUST HOW OR WHERE to cut cardboard consumption was not at first clear. There was not much visible waste in cardboard or anything else. After all competition has always been exceptionally keen in the rubber business. The problem is where to trim the edges to earn a profit.

No one at Goodrich knew what changes would be made in packing to conserve cardboard. No one could foretell how redesigned packages would look, and how many types and sizes would have to be eliminated or combined. No one could prophesy whether factory, salesman, or customer would be enthusiastic about the changes.

Our factory service division, a sort of liaison between factory and sales, decided to try. There is a little story about that, by the way. Traditionally, almost every company registers some conflict and occasional friction between factory and sales. Sales cannot understand why the factory may be short of needed merchandise at inconvenient times, and why important rush orders are not shipped with record speed. We have learned that a seemingly small order, say a shipment of multiple V-belts, may be needed for a sizable conveyor belt system—may conceivably tie up almost a whole plant until they get there. At Goodrich the entire factory aims to be sales-minded.

Cut—or Else

Now, a new challenge—from OPM—which Goodrich accepted seriously. In September the order was to cut 1942 cardboard consumption 25 to 33 percent—"or else." On November 14, 1941, the company was gratified to report that it had already instituted factory changes that promised to save 1,000,000 pounds of cardboard, fiberboard, and corrugated board in 1942. This estimate, based on 1941 production, covered the packaging of 32,000 different products.

Pounds of Cardboard Saved

Some unusual savings have been worked out. Take rubber heels, for instance. The millions of little boxes used for rubber heels were already about as simple and inexpensive as we could safely make them. Most rubber heels are applied by some shoe-repair man. The box never reaches the final customer; it is opened and tossed in the wastebasket by the cobbler. Previous economy waves had scrutinized these millions of little boxes and made minor savings. Obviously, you need a box sturdy enough to hold a pair of heels of a certain size, type, and color together, and to keep them clean and away from sunlight and air. Because rubber heels are highly competitive, the boxes have to carry the maker's name, trademark, and advertising message. All true. But we found we could reduce the caliper of board from 0.020 to 0.018 and effect savings of 43,200 pounds of cardboard a year, cardboard that can help package quantities of munitions or canned goods sent to our boys in camps and army posts.

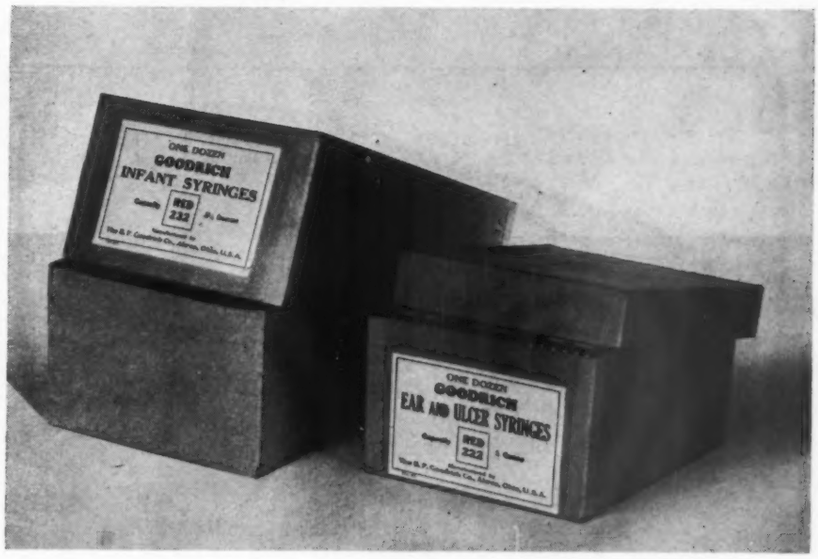
Inner tubes used to be put in a two-piece, full-telescoping box. For some time we had been using a one-piece, folding box with a friction lock at top and bottom. Even so, we found we could drop from 0.028 to 0.020 on these inner-tube boxes and thus, in a year as good as 1941, save 336,698 pounds of cardboard.

Changes Carefully Made

Goodrich operates two box factories in its plants at Akron, and shapes and imprints most of its lighter cartons. Changes were made cautiously and thoughtfully, and only under the supervision of company packaging engineers. (Whenever new specifications are decided upon and a simpler or lighter package is made and tested, it is put into use only after the existing supply is exhausted.) A complete stock-list is kept and every care is taken to avoid obsolescence through introduction of a new package before old stock has passed on to customers' hands.

The changes we made were not put through in a day or even a month. Back in October the factory service division made a list of all boxes, trays, and inserts used in the packaging of drug sundries. Four hundred and

(Continued on page 224)



New-style syringe boxes in 1942 call for lids 1¼ inches deep instead of full telescoping. Result: 14,434 pounds less boxboard

ESTIMATED SAVINGS FOR 1942

	Boxboard (pounds)	*Fiber and Corrugated Board (pounds)*
Drug Sundries		
Standardization of packages and lines to three sizes for bottles and combinations, and three sizes for syringes, and reduction in caliper	48,435	16,118
Heels and Soles		
Reduction in caliper of small heel boxes	43,200	
Mechanical Goods (now to be called Industrial Goods)		
Change in garden hose packages		153,368
Reduction in caliper of gasket boxes	7,595	
Change in Koroseal shipping containers—fiber drums to large corrugated pallet boxes		208,800
Redesigned de-icer shipping cases		5,587
Tires, Tubes, and Accessories		
Reduction in caliper of tube boxes	336,399	
Elimination of certain fan belt boxes and sleeves	61,700	
Elimination of certain friction-tape display boxes	3,276	
Display cards eliminated	2,450	
Miscellaneous		
Sorting and reconditioning of used cartons		115,027
Total Pounds Saved	503,055	498,900

Welcoming the New Man

ROBERT JONES, General Foreman (Night), Jones & Lamson Machine Co., Springfield, Vt.

FOREMAN'S CHECK-LIST

1. WAGES

a. When does a new man get his first pay?

b. Overtime—how figured? Explain payment for Sunday.

c. Company policy gives new man three months to prove himself—a sort of "probation period." Show why this must be.

d. Raises—how handled? By whom? A man is free to ask and expect a frank answer.

e. Put man on schedule and explain how it works.

2. TIME SYSTEM

a. Explain time cards. On and off production. When is it permissible to "punch off" a job?

b. Explain the performance rating system.

3. DISCIPLINE.

a. Man is expected to stay on his job during working hours. A cup of coffee, sandwich, etc., are okay, but stay by the machine. Explain the reason for this rule.

b. Work starts promptly at 7.10 p.m. and continues until 7.10 a.m. Explain about taking lunch period.

4. SCRAP AND POOR STOCK

a. Foreman must pass on all poor stock. Show examples of poor stock in cast iron and steel.

b. Never let a piece go that is outside the limits except with foreman's permission. A spoiled piece that is passed on to the next operation adds useless expense.

5. CHANCES FOR ADVANCEMENT

a. A good machinist is a valuable and well-paid man.

6. INTRODUCE MAN TO THE SHOP

a. Tell him about the personnel department, the J. & L. Benefit Association, the first aid room, the doctor.

b. Introduce superintendent and assistant superintendent.

c. Show the new man the machines we make. What can they do? Where do they go?

d. Designate one older employee to be the new man's sponsor for a week or so to make him feel that someone feels a special interest in him.

7. MEN ON THE OTHER SHIFT

a. Go more than half way—it pays.

b. Come in a few minutes early—spend some time picking up set-up. Explain your set-up before going home.

The foreman who explains company policies and methods can make the new man feel as if he really "belonged." And it's a sure way to build a sound working force

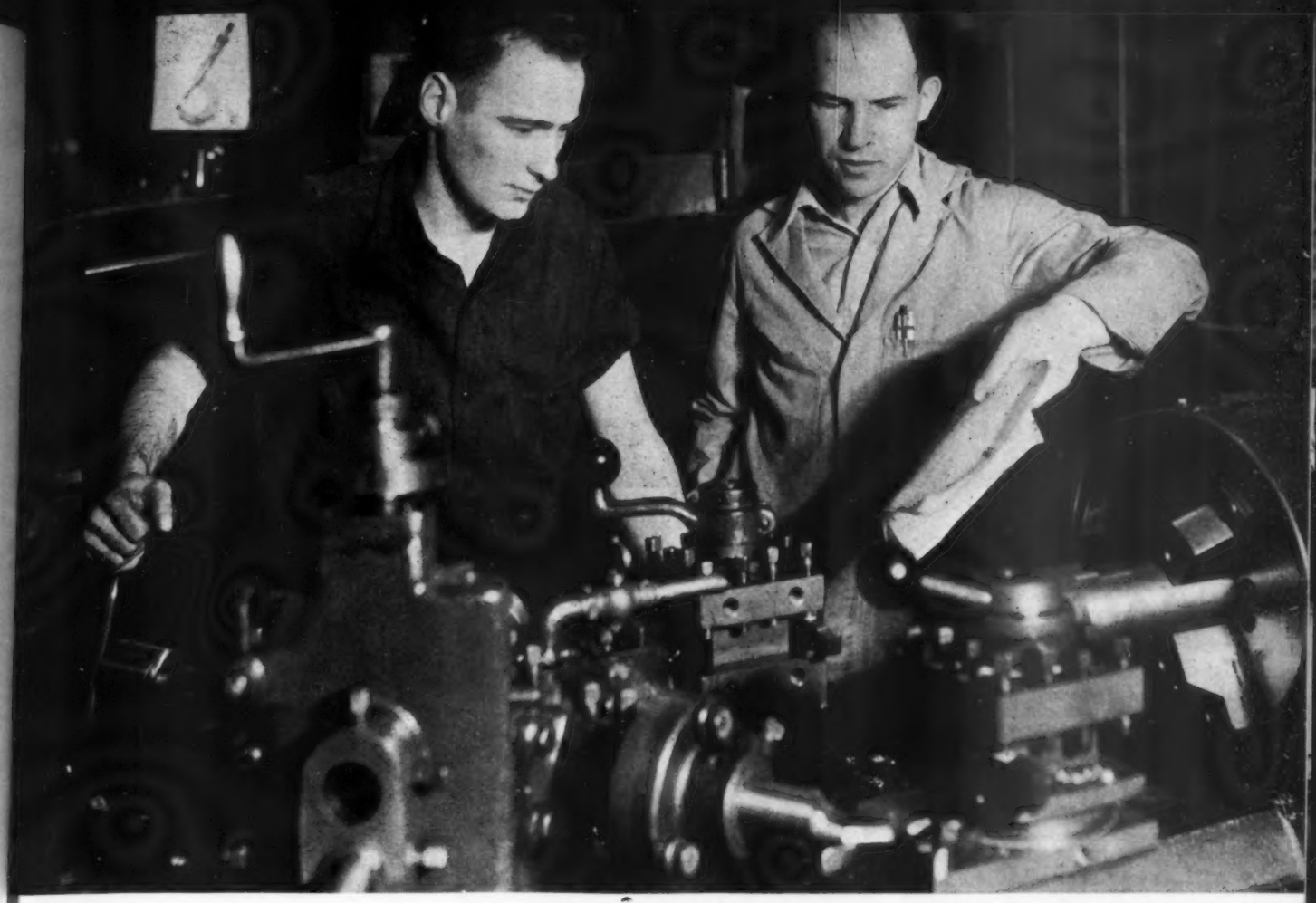
FOR GOOD OR ILL, the new worker must depend chiefly upon his foreman for his first impression of the plant. If the foreman fulfills this duty well, there is a good chance that the best efforts of the new worker will be forthcoming. Inducting new workers into a rapidly expanding work force thus puts a responsibility upon management generally, and upon the foremen particularly.

The management of Jones & Lamson Machine Company expects us foremen to do our part in making the newly hired man feel that he has a place in our work force, and in helping him to understand the company's policies and standards. We foremen are glad to bear this responsibility, and we feel that a good job has been done all around in this regard. But, if there is room for improvement, we want to know about it.

What to Say

Therefore, some of us have worked out a "rough and ready" check-list of items the foreman should cover in his first talk with a newly hired workman. We don't pretend that this is the best check-list that could be devised; experience may show that it needs to be lengthened, perhaps shortened, or otherwise modified. But we feel that it has the advantage of serving as a reminder of items our new men ought to know. By consulting this outline in the course of his first talk with a new man, the foreman is relieved of the need for depending wholly on his memory, which is pretty well burdened nowadays with other matters.

A new man has many questions that must be answered by the foreman. As the management's contact



Robert Jones, (right) introduces a new man to his job on the nightshift. Prof. John P. Troxell of the Amos Tuck School of Business Administration, through whom Mr. Jones's manuscript came to *Factory*, writes, "He (Jones) came off a Vermont farm two years ago (a man of 27 with three children). He had never, I think, seen a lathe. He took a quick course in the trade school of Springfield, Vt., and recently he became general foreman in Jones & Lamson. He attended my course in foremanship this winter, and I have never had a student whom I admire more greatly. A real man, and a leader"

with men in the shop, the foreman must explain and interpret wage rates, overtime, the time system, rules, and so on. He must also do quite a bit of personnel work, introducing men to the shop and helping them to adjust themselves to their work and feel at home.

The check-list that we use appears on the opposite page. It may prove helpful to other foremen who have the responsibility of inducting new men.

The First Talk With the New Man

(The following is a suggestion as to the way the first talk might go. Some, but not all, of the above points are covered. The foreman should think out his own way of presenting this material, rather than memorize the following. In other words, recast it in your own words.)

As a newcomer to Jones & Lamson there are many things that we should like to tell you about our company's policies, rules, and traditions. Some of them go back to the days when the company made muzzle-loading rifles, but of course our company has grown and changed with the times. Our past has been splendid; our future will be more so.

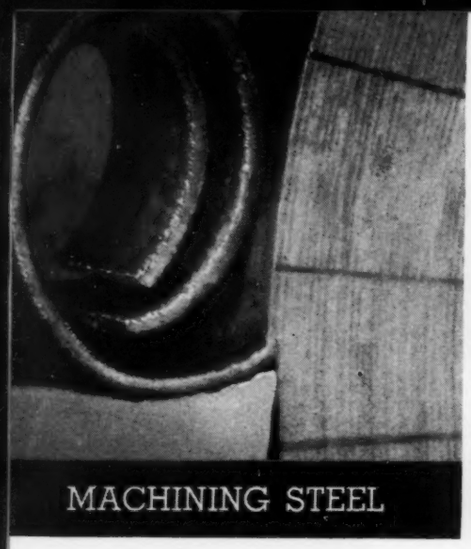
As your work will be concerned with machine tools, we want you to be familiar with them. During your first week the foreman will be glad to show you the types we make here, and what they will do. He will undoubtedly tell you that J & L machines are the best made. We are all proud of that, and feel that it is due largely to the fact that a machinist here in Springfield is really a craftsman rather than a cog in a production machine. Machines go from here to all parts of the world. Springfield, Vermont, is as well known in Russia and Australia as in the United States. Where our machines go, J & L roadmen follow. They tell some exciting stories when they return.

The company takes an interest in us. J & L has the reputation of being a good place to work, and the personnel department is constantly working to improve it. Physical welfare is looked after by the doctor and the nurses in the first aid room. *All injuries must be reported to them*, no matter if you think the injury is slight.

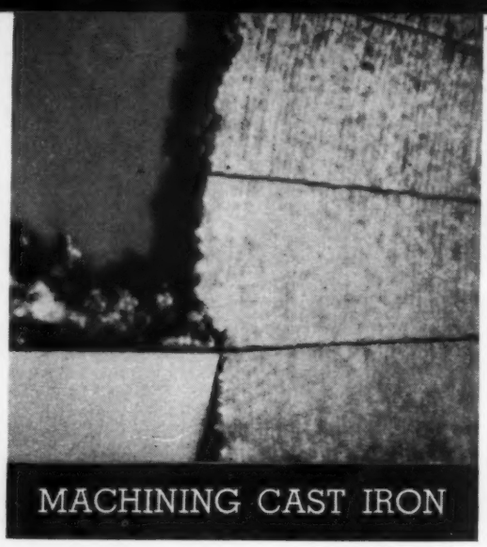
Profits from the soft drinks, candy, and cigarette machines in the shop go to the J & L Employees' Benefit Association. All employees are members. The money is used to help members who have hard luck, to promote athletic activities, to provide scholarships for worthy schoolboys, etc.

A new man is "on approval" for three months. If he is retained at the end of that period, he gets a raise.

(Continued on page 230)



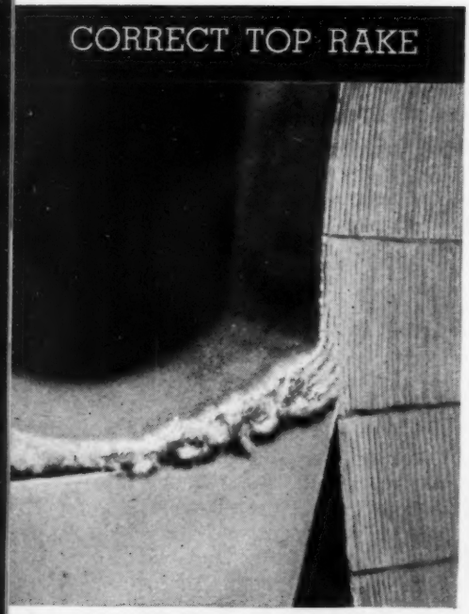
MACHINING STEEL



MACHINING CAST IRON

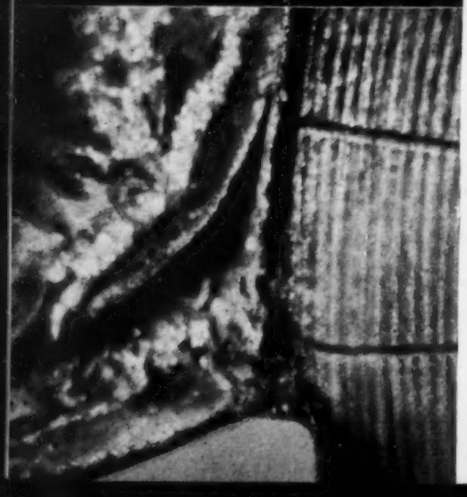
MACHINING BRASS

What Every Operator Ought to Know About Cutters



CORRECT TOP RAKE

INSUFFICIENT TOP RAKE



DULL CUTTER

SHARP CUTTER

To help America make full use of its huge machine-tool capacity, a builder of turret lathes offers a free course in grinding and setting cutting tools

PERFORMANCE of cutting tools, more than any other single factor, determines to what extent the operator gets out of his machine all that was built into it.

The Warner & Swasey Company of Cleveland knows that to be true, has long subscribed to the belief that the maker's responsibility for his product extends into the users' plants. A year and a half ago it therefore pioneered in in-plant instruction of turret-lathe operators. Now it offers a new service. A staff of instructors specially trained in the technique of grinding and setting cutting tools will conduct one-hour programs in metal-working plants and training institutions everywhere.

Shown here are "stills" from a sound film that slows up and magnifies metal-turning operations, thus revealing the secrets of cutting tools in action. Lecturers also use model tools, giant model cutters, and charts, and distribute an illustrated booklet that high-spots the fundamentals.

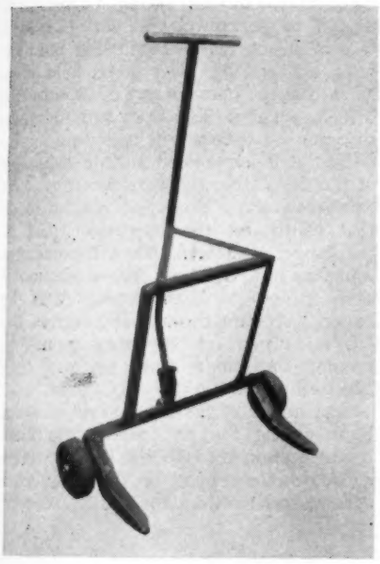
MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

Pan Carrier Saves Time and Energy

HARRY PLETCHER, Elkhart, Ind.

The picture shows a new way of carrying pans of castings in our shop. We have pans that hold from 50 to 100 pounds of



castings per pan, so that it is not easy to carry them around from place to place by hand. We did pull them along the floor with a hook, but this was hard work.

The carrier shown in the picture is pushed under a pan or a stack of pans, tilted back, and then pushed or pulled to wherever the castings are wanted. A stack of pans three feet high can be carried with this carrier.

•

Nine Steps That Insure Return of Containers

JOSEPH M. ROBINS, Norwalk, Conn.

War has put emphasis on conservation of steel. Here is an effective method of insuring the return of empty shipping containers—steel drums and the like—that has been used successfully by my plant for many years. By simply considering all non-destructible containers as returnable, you can extend the method to provide control over all that permit re-use. The following nine steps outline our system:

1. Label each container immediately on receipt. Labels should be numbered in sequence and read as follows:

> CONTAINER NO.....
> AS SOON AS THIS CONTAINER IS EMPTY RETURN IT TO RECEIVING DEPARTMENT FOR RESHIPMENT TO SUPPLIER.
> DO NOT DESTROY OR MUTILATE THIS LABEL AS THE NUMBER IDENTIFIES THE CONTAINER.

2. On the receiving report indicate the receipt of the container or containers, furnish an accurate description, and note the numbers assigned.

3. Transfer to the purchase invoice the details concerning the containers, including the numbers assigned. (For returnable containers the details appear on the invoice or on a separate memorandum invoice and it is necessary merely to indicate the numbers assigned.)

4. In the accounting department keep a record of all containers in numerical sequence. Show pertinent details. In the column headings include container number, date received, supplier, city, type, size, date of invoice, amount charged, date returned, return slip number, debit memo number, date of debit.

5. When empty containers are returned the container number should appear on all return slips and on the debit memorandum used as the charge back. The accounting department should record the return beside the original entry.

6. No less than once a month prepare and submit to the accounting department a comprehensive inventory of all containers on hand, no matter what part of the factory they may be in. (Such inventory calls

Management, How Good Is Your Control?

Ask yourself these questions to check up

20. PRODUCTION SCHEDULE

1. What is your understanding as to the meaning of schedule? Do you fully appreciate its importance?

2. Are your sections on schedule? If not, and your unit is also off, which sections are responsible for throwing your unit off? What can be done? Are you doing it?

3. Would an internal schedule—that is, completion times for cleaning, assembling, machine operating, manufacturing, etc.—improve your production performance?

4. What can be done to improve on your particular portion of the shop schedule?

5. Have you made an effort to remove all obstacles which may be present to hinder your units in their attempt to maintain schedule? Which are the parts or assemblies most often behind? Why are they?

6. Is parts shortage a major problem in maintaining your production schedule? Is it always the same parts? How did you correct this?

7. Is insufficient jig capacity holding up production? Is another jig justified?

8. Do you think machine tooling inefficient? What have you done about the situation?

9. Is machine capacity inadequate? What recommendations have you made?

10. Do all your men appreciate the need for schedule? Do they understand it? Which are most often behind? Why?

11. Have you tried a change in mechanics to determine if the present man is properly adapted and the most efficient for the particular job at hand?

Prepared by HARDING PALMER, *Industrial Engineer*
Lockheed Aircraft Corporation, Burbank, Calif.

attention to any empty containers that have not found their way back to the receiving department, and consequently have not been returned.)

7. By recording in the book maintained for the purpose, details concerning containers that have been returned, the accounting department has a record of the containers on hand. Check of the inventory prepared monthly against this record reveals whether any containers have disappeared or perhaps have been returned without proper charge back for costs incurred.

8. An occasional report should be made to management by the accounting department on containers that have been on hand an exceptionally long time.

9. Include the value of returnable containers as an item in all financial reports.

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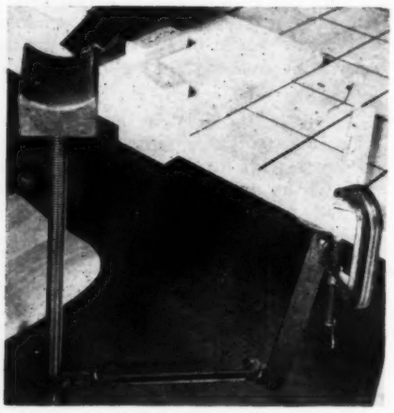


For the motion-economized workplace there is the armrest developed by J. H. Heerlein of Raymond Manufacturing Company, Cory, Pa. It can be accurately adjusted for position and height to accommodate any operator, makes the operator feel completely at home, is a real aid to the elimination of fatigue

•

Teach All How to Use Safety Equipment

J. HOWARD MYERS, Safety Engineer, The Atlantic Refining Company, Philadelphia

To familiarize employees of its Philadelphia refinery with the use of safety equipment, The Atlantic Refining Company conducted a series of one-hour combined lectures and practical demonstrations, where every employee had an opportunity actually to handle the equipment and learn the purpose for which it was intended. The lectures and demonstrations centered about the exhibit of safety equipment available to employees.

While many employees use safety equipment day in and day out, many others have only occasional need of such equipment, and consequently had only a vague idea of what was available to them.

Employees attended the classes in groups of 25 to 30. Discussions and demonstrations were led by the chief of the plant protection department.

The safety equipment display is permanently set up, so that from time to time, as new men enter the employ of the company or changes are made in the equipment, classes can be resumed.

This method of educating employees in the use of safety equipment has proved satisfactory, because they not only know what equipment is available, but also have been schooled in knowing when, where, why, and how it is to be used.

•

Egg Timer Solves Timing Problem

SOURCE—Oliver Iron & Steel Corporation, Pittsburgh

The operation of lacquering small bolts, a repetitive, product-finishing process involving loading, washing, rinsing, centrifugal drying, lacquering, and centrifugal removal of excess lacquer, presented a difficult problem of timing to establish a wage incentive in our screw machine department.

We found the solution in an ordinary three-minute egg timer of the hourglass variety. This simple device scheduled the centrifugal lacquer-drying operation and, in addition, provided a visible time gage to enable the operator to plan his multiple duties without wasting time and delaying production by excessive trips to and from the dryer.

With this simple scheme we have considerably increased production and have at the same time been able to establish a fair wage incentive.

•

Swivel Hanger Cuts Down Spraying Time

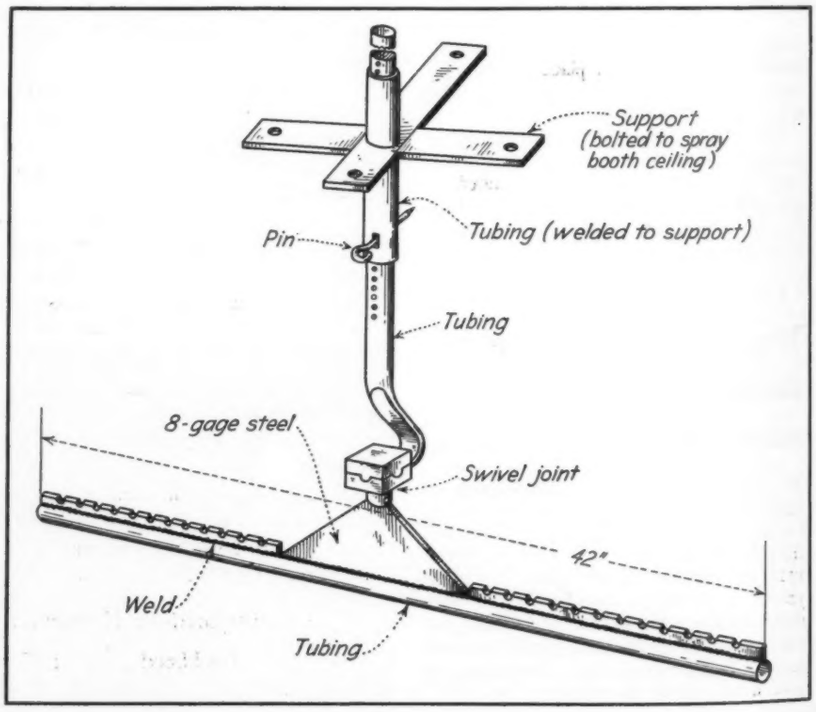
S. R. TERANES, Two Rivers, Wis.

When spray booth operators rig hangers on which to suspend work while they spray it, they often fail to provide a means for turning the work. If both sides are to be sprayed, this means that they must first spray one side, then remove the pieces, turn them and hang them again for spraying on the other side.

We have built several fixtures of the type shown in the sketch. They have proved to be convenient, and they will take most any type of work that must be hung for spraying. The swivel joint is so made that the operator can easily turn the hanger, yet it is held from turning while the spraying operation is going on.

In the block welded to the extension of the supporting tubing is a recess. Into this recess sets a projection on the block that constitutes the uppermost part of the hanger assembly. When the operator wants to turn the work, the projection is easily turned out of the recess. After the hanger has swung through 180 degrees, the projection drops into the recess again, thus keeping the hanger from swinging back and forth while the spraying is done.

The height of the hanger can be varied by removing the pin, sliding the inner tubing section through the tubing section welded to the support on the spray booth ceiling, and resetting the pin.



MAINTENANCE SERVICES

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

CONTENTS OF THIS ISSUE

Editorials 98

To Keep Little Motors Going When the Big Motor Starts. *W. K. Boice* 99

Ready for Raids..... *William F. Robbins* 101

What Cold-Cathode Fluorescent Lighting Is..... 113

Scheduled Lubrications Saves Oil, Machinery, and Time. *J. L. Looney* 115

Incentives Cut Wiring Costs. *C. H. Brechin and P. M. Matthews* 118

How to Save Towels and Tissue..... 120

Maintenance Shorts 122

Data Sheet: When to Replace Wire Rope..... 126

What's New in Equipment..... 136

Catalog Service 246

MAINTENANCE CONTENTS OF THE THREE PRECEDING ISSUES

FEBRUARY

Don't Abuse Rubber..... 89
Faster, Slower with Multispeed Motors..... 97
How to Get the Most Out of Your Air Circuit Breakers.....100
Instruments Win Our Battles.....103
Right Cleaning Saves Floors.....105
Maintenance Shorts 110
Data Sheets: How to Inspect Drums and Sheaves Used With Wire Rope 114
What's New in Equipment.....128
Catalog Service 218

MARCH

How to Get the Most From V-Belt Drives..... 77
How to Conserve Tools..... 80
Training for Maintenance..... 81
Plant Operation Library No. 50
Maintaining Buildings Under Corrosive Conditions..... 89
High-Voltage Distribution Saves Copper..... 92
Maintenance Shorts 96
Good Lighting Will Help Us Win.....101
A Special 36-page Section
What's New in Equipment.....146
Catalog Service 248

APRIL

Flexible Maintenance Keeps Production Moving.....59
Know How to Take Care of Single-Phase Motors?.....61
How to Keep the Loudspeaker System Working.....64
Maintenance Shorts.....68
What's New in Equipment.....82
Catalog Service.....following page B-140

FACTORY MANAGEMENT AND MAINTENANCE

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

MAINTENANCE as the Editors See It

Less Noise Means More Work

WHEN EXPERIENCED WORKERS assembled temperature regulators in a room next to a boiler shop, 60 defects were found in the 80 units that were put together within a certain time. Working in a quiet place the same group put together 110 units in the time previously required to assemble 80 units, and only 7 defects were found in that batch.

This incident and several others of like import are cited by the National Noise Abatement Council in support of its campaign to reduce nervous tension and increase personal efficiency by eliminating unnecessary noise. A highlight of this campaign will be the observance of National Noise Abatement Week from May 31 to June 6.

There is plenty of evidence to show that reduction of noise is of more than academic interest to industry. It is common experience that one can think more clearly and work at higher efficiency in a quiet place. Medical men testify that noise injures the nervous system, blunts all our faculties, reduces the precision of action, makes us irritable and pessimistic.

It has been estimated that in industry noise lessens mental and physical ability by 25 to 40 percent. That is a high price to pay for something that serves no useful purpose.

It is not to be expected that all noise can be eliminated from manufacturing operations. But anything that promises to increase the efficiency of industry's workers is well worth investigation.

Don't Try to Blackout With Blue Light

BLUE is about the least desirable of all the colors for blackout lighting. Despite much popular opinion to the contrary, that is the verdict of lighting experts.

Considerable use of blue light by the Navy during the previous war doubtless helped to establish it, in the minds of laymen, as perhaps the most suitable color for blackouts. In a recent issue of *Illuminating Engineering*, Dr. Luckiesh points out that blue light was used at that time as a matter of expediency. In any event, changed conditions in warfare make blue light less desirable now than it was then.

One unfortunate characteristic of blue light is that it appears brighter or outlasts light of other colors as their brightness level decreases or as the observer moves away. Hence, in effect blue light does not black out as well as other colors.

Similarly, a blue light or surface can be seen over a larger portion of the visual field than any other light of the same brightness. It is, therefore, more easily picked up by an aerial observer. As a blackout light it tends to defeat its own purpose.

The final count against blue light lies in the fact that normal eyes cannot bring objects illuminated by it into focus when they are more than a few feet away. The eyes are handicapped even when trying to see objects within reach. Everyone probably has noticed that blue or blue-green luminous tube signs always appear hazy when viewed at any distance, because they cannot be focused by normal eyes.

Blue light has nothing to recommend it for blackouts.

Maintenance Can Help Teach Conservation

"WHEN THIS PIECE OF HOSE goes bad we'll get another one, of course." That answer was given to a plant executive when he showed a workman some air hose lying in a pool of oil. Only ignorance and carlessness would prompt such a reply. Nevertheless it is probable that these twin enemies of conservation and efficiency are much too widespread for our good.

Heretofore we have always had plenty of everything in this country. Hence there have been few compelling reasons for taking the care necessary to make items and supplies of all kinds last longer. There was always more where they came from.

A different situation exists today. There are shortages of many materials, and that condition may be expected to grow worse, rather than better, for some time. Wherefore the urgent necessity of explaining the need for conservation, and making sure that it is practiced.

Because maintenance men go everywhere around the plant, they have an unusual opportunity to detect waste or misuse of any item. They are learning from experience that many things which used to be had in any quantity are now difficult, perhaps impossible to get. And they can do a great deal to make other workers see why conservation is something that must be practiced by everyone.

A friendly tip here and there will go a long way toward dispelling the carelessness or ignorance of why waste must be prevented, and how it can be done.

To Keep Little Motors Going When the Big Motor Starts

It's done by the use of suitable motors and starting methods that reduce starting current and lessen voltage dips, and voltage regulators that reduce their duration

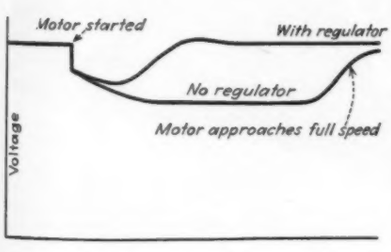
W. K. BOICE, Industrial Engineering Department, General Electric Company

THERE'S LIKELY TO BE trouble when motors are large enough to cause noticeable disturbance of line voltage at the time they are started. This problem becomes important whenever the starting current of the motor is a sizable proportion of the rated output current of the power supply. Hence trouble may be encountered with both small and large installations from small engine-driven generators to the largest plants, such as steel mills, in which motors of 5000 horsepower or larger must be started.

To prevent such disturbances from interfering with plant operation and to assure sufficient torque for starting, requires not only proper selection of the motor and its control, but also of the generating, distributing, and voltage regulating equipment of the plant.

An industrial plant may obtain its power from generating equipment forming a part of the plant, from a public utility system, or from both.

Since the load of an industrial plant is usually only a fraction of the total load on a public utility system, it is only seldom that the starting current of a motor in a plant can cause a dip of more than a few percent in the system voltage. A small voltage dip may, however, be important since public utility systems must adopt more stringent measures to avoid light flicker than are usually necessary for a factory. Power contracts usually contain clauses that limit the starting current that can be drawn by any motor in a plant supplied by the utility.



How generator voltage behaves when a motor is started

In plants supplied by utility systems it is commonly necessary to see that the starting current limitations are met by use of a suitable type of motor or reduced-voltage starting equipment.

When reduced-voltage starters are used to reduce the line current at start, care must be taken to see that the corresponding reduction in starting torque does not prevent successful starting. Information as to the full voltage starting current and torque of a.c. motors is readily available.

In relatively rare cases the starting current, while not too large to comply with power company requirements, may be large enough to cause an objectionable voltage drop in the transformers and feeders supplying the motor. For example, a 100-hp. motor having a full-voltage starting current of six times normal will cause a voltage drop of approximately 25 percent through a 100-kva. transformer. Severe voltage drops usually occur only when the motor is supplied by an unusually long feeder or by a transformer only about as large as is required to supply the continuous load of the motor itself.

When a plant is supplied by a generating station just about large enough to carry the load, as in the case of a factory that supplies its own power or that is supplied by a relatively small utility system, the voltage disturbance caused by the starting of a large motor may be quite severe. It may possibly disturb the operation of running motors or controls, as well as induce objectionable light flicker.

When the total kva. capacity of the generators is not many times the horsepower rating of the motor to be started, attention must be given to the behavior of the generator voltage at the time of application of a motor starting load.

How the voltage of an a.c. generator behaves when a motor starting load is suddenly applied is illustrated at the left. At the instant the load is applied the generator voltage drops. The amount of this instantaneous drop is not affected by the presence of a voltage regulator. After the sudden drop the voltage continues to fall, although gradually. If no regulator is in use the voltage will level off to a steady value at which it will remain until it rises as the motor approaches full speed. To be conservative it is usually best to assume that the reduction in current as the motor approaches full speed does not affect the minimum voltage reached. The time at which this mini-

W. K. Boice is a native of Lansing, Mich. After being graduated from the University of Michigan in 1935, with a bachelor's degree in Electrical Engineering, he entered GE's test department. For the past three years he has been a member of the industrial engineering department, working primarily on problems concerning the selection and application of electrical equipment in industrial plants

mum voltage is closely approached may vary, depending on conditions, from about one-half second to several seconds. The subsequent time at which the voltage returns toward normal is, of course, dependent on how quickly the motor accelerates its load.

If a voltage regulator is used it arrests the fall of the voltage following the instantaneous drop, so that, although the voltage falls off somewhat after this drop, it does not fall as far as it would if there were no regulator. The time required to reach minimum voltage with a regulator is ordinarily of the order of one-half second or less.

After the minimum voltage has been reached the regulator restores the voltage toward normal. On its return the voltage may overshoot slightly or if the load is a heavy one the voltage may not return all the way to normal. At the low power factors involved in motor starting the regulator will usually restore generator voltage to normal if the total load kva. drawn by the motor being started and by the initial load on the generator does not exceed the generator rating. If the regulator can do this, the time required does not usually exceed one or two seconds.

By reducing both the amount and duration of disturbances the use of a voltage regulator makes it possible to start a given sized motor from a much smaller generator than could be used without a regulator. The cost of regulating equipment is only a small fraction of the increase in generator cost that would be required to obtain comparable performance without regulating equipment.

The extent to which the voltage may be permitted to drop and the value to which regulators, if present, must be able to restore the voltage, are determined by the requirements of the equipment connected to the generator.

Light Flicker. This factor places much more severe limitations on voltage dip than do most other limiting conditions. The acceptability of light flicker is affected by the type of work being done in the lighted location, by the characteristics of the observer, and by both the magnitude and frequency of the voltage dips. Dips at a frequency of about 8 cycles per second, such as might be caused by a reciprocating compressor, are most noticeable and may be perceived even when they have a pulsation as small as about 0.5 percent. If the dips are infrequent, a dip of 1 percent in voltage may not be perceptible. A dip that is perceptible may not be objectionable. Also, infrequent dips as great as 5 percent or more may be acceptable.

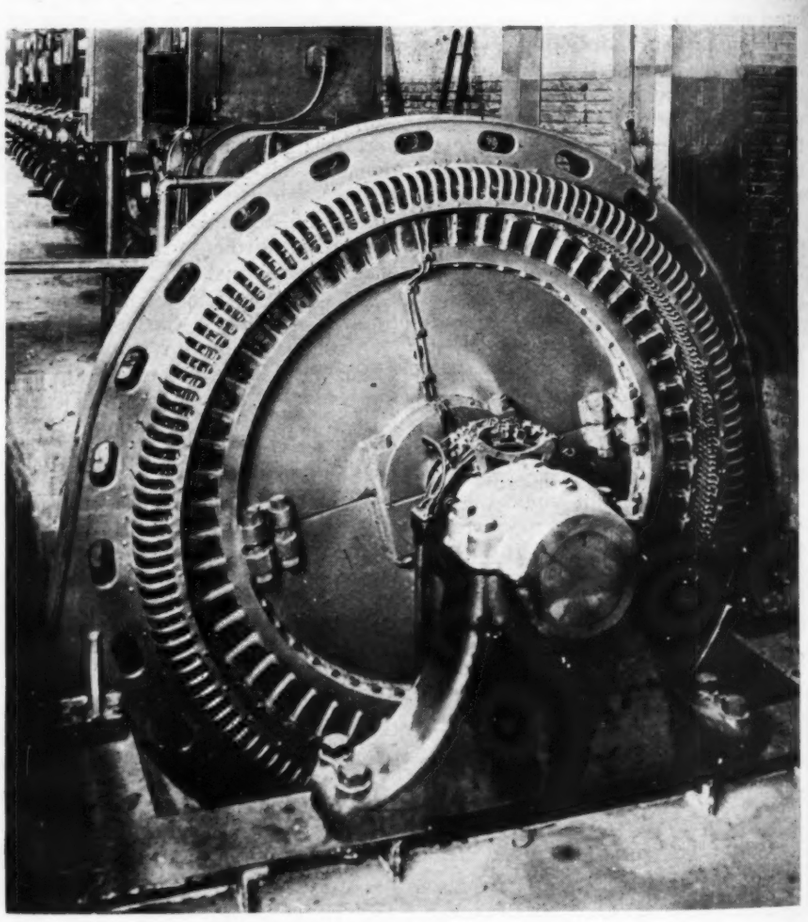
It is usually not economical to attempt to eliminate light flicker entirely on systems of limited power capacity. On the other hand there is little agreement as to what constitutes acceptable flicker. Consequently when light flicker is a determining factor it is desirable to define for each particular case the requirements with respect to flicker in terms of voltage drop under specified conditions.

Motors in Operation. If the voltage dips to less than 70 percent there is a possibility that motors already operating on the system may stall. Also, if the motors are temporarily loaded above their ratings, as may happen on special duty cycles, stalling or pull-out may occur at voltages that are not so low as 70 percent.

Undervoltage Protection. The voltage disturbance should not be so severe as to cause undervoltage protection to disconnect the motor or other equipment. If the undervoltage protection is provided by a device to trip a circuit breaker, it may be of the time-delay type, which permits the breaker to remain closed during momentary disturbances. On the other hand, if the protection is provided by the inherent characteristic of a contactor to drop out on undervoltage, the contactor will open almost immediately after the voltage falls to the drop-out value. (Some control equipments are provided with time-delay devices that permit a contactor to reclose within a certain time interval, but this is not always helpful as it does not prevent disconnection during the disturbance.

Contactors are designed to pick up when the voltage is not less than 85 percent. When picked up, most of them will hold in even though the voltage dips to as low as 65 percent.

(The second and concluding instalment of this article will appear in an early issue.)



Voltage dips from starting large motors can be cut by suitable starting equipment. This motor drives a rubber mill line

READY FOR RAIDS

Control center at G&K, with ARP chiefs at their stations and Chief Warden Robbins at the microphone

WILLIAM F. ROBBINS

Plant Engineer and Chief Air Raid Warden, Graton & Knight Company, Worcester, Mass.

AIR RAIDS, if or when they come, will not catch Graton & Knight napping. We have been thinking about them, planning for them, since last summer. At that time we sent a man to the air raid school at Massachusetts Institute of Technology. In the fall we set up an air raid precautions organization on paper. The day after Pearl Harbor, we put it into effect.

We are leather tanners, belt makers, and manufacturers of packings and leather specialties. Practically all of our production is directly or indirectly connected with the war effort.

Our plant is one of dozens of important war plants in a big industrial city. We have no illusions about the possibility of raids coming our way. Worcester is a scant 50 miles from the coast, certainly within easy range of carrier-borne planes, and directly in the path of long-range, land-based bombers. It could well be a major target for enemy bombers.

The plant consists of a number of multi-story buildings of brick and reinforced concrete construction, and three small wooden structures. G&K employs over 1000 people, some of them on second and third shifts.

Fire protection was the primary consideration at the start. So the plant was divided into three major divisions, each in charge of a division warden. The first aid group was similarly set up. It was found better, on the other hand, to organize the engineering section (power service, vital records, rescue, salvage) by functions. For evacuation, it was obviously best to organize by buildings.

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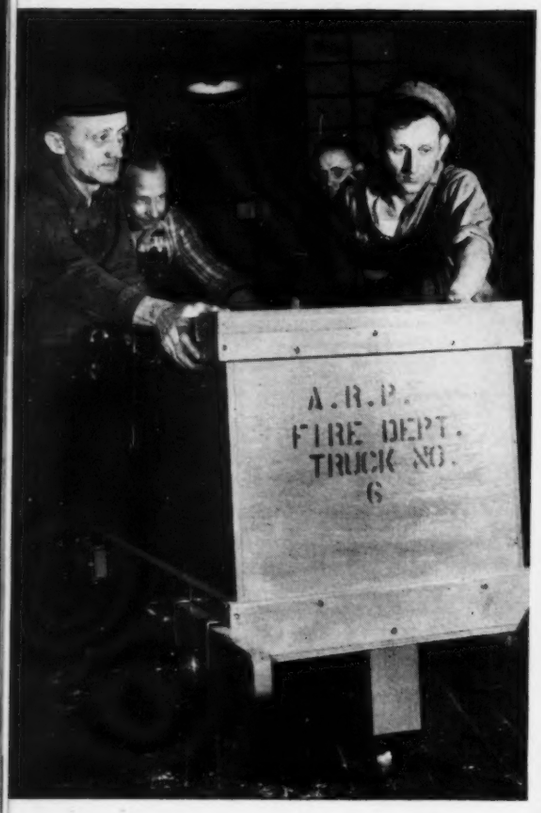


On the air raid signal G&K's three mobile squads of firemen rush into action, each with its truck-load of fire-fighting equipment

Mobile squad arrives at point where bombs have fallen, gets out its equipment, and prepares to back up the efforts of a spotter crew

F I R E

Spotter on roof is one of eight men assigned to each multi-story building to watch for bombs

SPOTTERS AND MOBILE SQUADS make up the fire department. The spotters watch for and take care of incendiary bombs. The mobile squads assist and back up the spotters, and take care of any fires that the spotters cannot handle. There are three mobile squads, each reporting directly to a division warden, who in turn reports to the chief warden.

Spotter stations—there are 30—are located on the two top floors of all multi-story buildings, in the approximate center of each room and on a main aisle. Eight men are assigned to each building—a building warden in charge, one man on the roof, three on the top floor, three on the next-to-top floor.

In single- and two-story buildings, two men are assigned to the top floor, and the roof watching is covered by spotters on the taller buildings. In small buildings that are not heated, salt has been added to the water in the drums at the spotter stations to prevent freezing. In multi-story buildings, a pile of sandbags is left at the foot of the stairs leading to the roof.

Flying Squadrons

Mobile squads are located at strategic points on the next-to-top floors in main buildings. Each is equipped with a portable truck containing special fire-fighting equipment. Trucks were built in our own carpenter shop, are on casters, can be rolled quickly to the scene of a fire. They are also equipped with retractable handles so can be easily moved up and down stairs; the power will be off in a raid, remember, and elevators will not be running. A messenger is assigned to each squad in case the communications system breaks down.

These mobile squads are moved

Three men man each spotter station in a raid. One operates the stirrup pump. Second directs spray on incendiary bomb or burning woodwork. Third stands by to maintain a constant supply of water

about as needed in their respective divisions, but leave their own areas only on order of the fire chief or chief warden. This is to prevent concentration at one point, at the expense of protection for the rest of the plant.

Men on the mobile squads normally work days, so are expected to return to the plant at night as soon as an air raid alarm is sounded.

The night superintendent is the fire chief, and a night organization of spotters operates under his direction until those on the day force can report for duty. As soon as the day building wardens report, they take charge of their stations. In a daytime raid, a division warden takes charge until the fire chief reaches the plant.

Each division warden has a floor plan showing main sprinkler shut-off valves for which he is responsible. Each valve has a tag showing its number and the building it controls. If a valve is closed on order of the division warden or fire chief, the tag is removed and sent by messenger to the control center. The fact is noted on a master plan, and the chief warden instructs the engineering chief to have the service restored. When service has been restored, the tag is returned to the division chief to be replaced on the valve. When the fire chief has checked restoration of service, he notifies the control center, whereupon the note on the master board is cleared.

To avoid interruptions to production, ARP men are recruited when possible from the maintenance force. For example, the three division wardens are, respectively, the foreman carpenter, his assistant, and the leading man in the shop.

G&K's control center, with chief warden and assistants at their posts, is pictured on page 101. See page 112 for brief description.

EQUIPMENT

Spotter Stations

1 55-gal. steel drum full of water
3 12-qt. G.I. pails
1 stirrup pump with 30-ft. hose
8 bags of dry sand (20-25 lb. each)
1 body shield (G.I.)
1 square long-handled shovel
1 non-breakable flashlight

Mobile Squads

Three portable trucks, each equipped with:
1 40-lb. carton of G powder to extinguish magnesium fires
1 waterproof searchlight
7 pairs rubber boots
1 fireman's axe
7 smoke masks
2 soda and acid extinguishers
1 Foamite extinguisher
1 stirrup pump
3 12-qt. pails

CONTINUED ON NEXT PAGE

READY FOR RAIDS CONTINUED

Left, out go the floodlights. Above, guard questions incoming truckdriver

POLICE

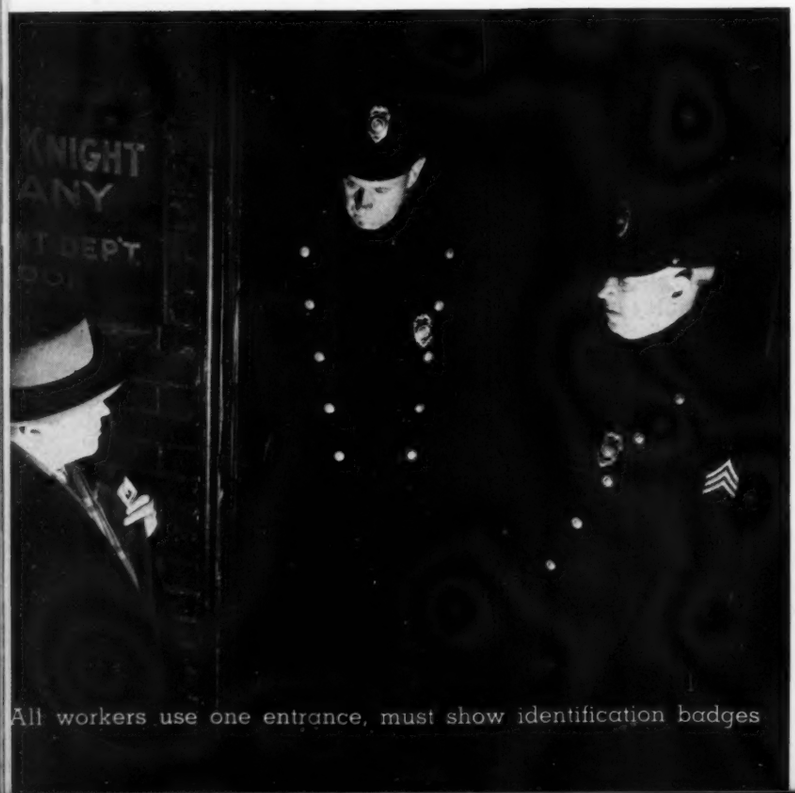
OUTSIDE AND INSIDE PATROLMEN augment the usual peacetime force of night watchmen and entrance guards. Employees enter and leave the plant by one door, are provided with photographic identification badges.

Visitor control has been tightened. Only necessary visitors are admitted, and only with a pass. They must be accompanied at all times by a responsible person.

Car drivers only are allowed in the parking space. All passengers leave or enter cars outside entrance to area. Drivers of trucks and their helpers are under constant surveillance.

All guards have been fingerprinted, and all employees will be.

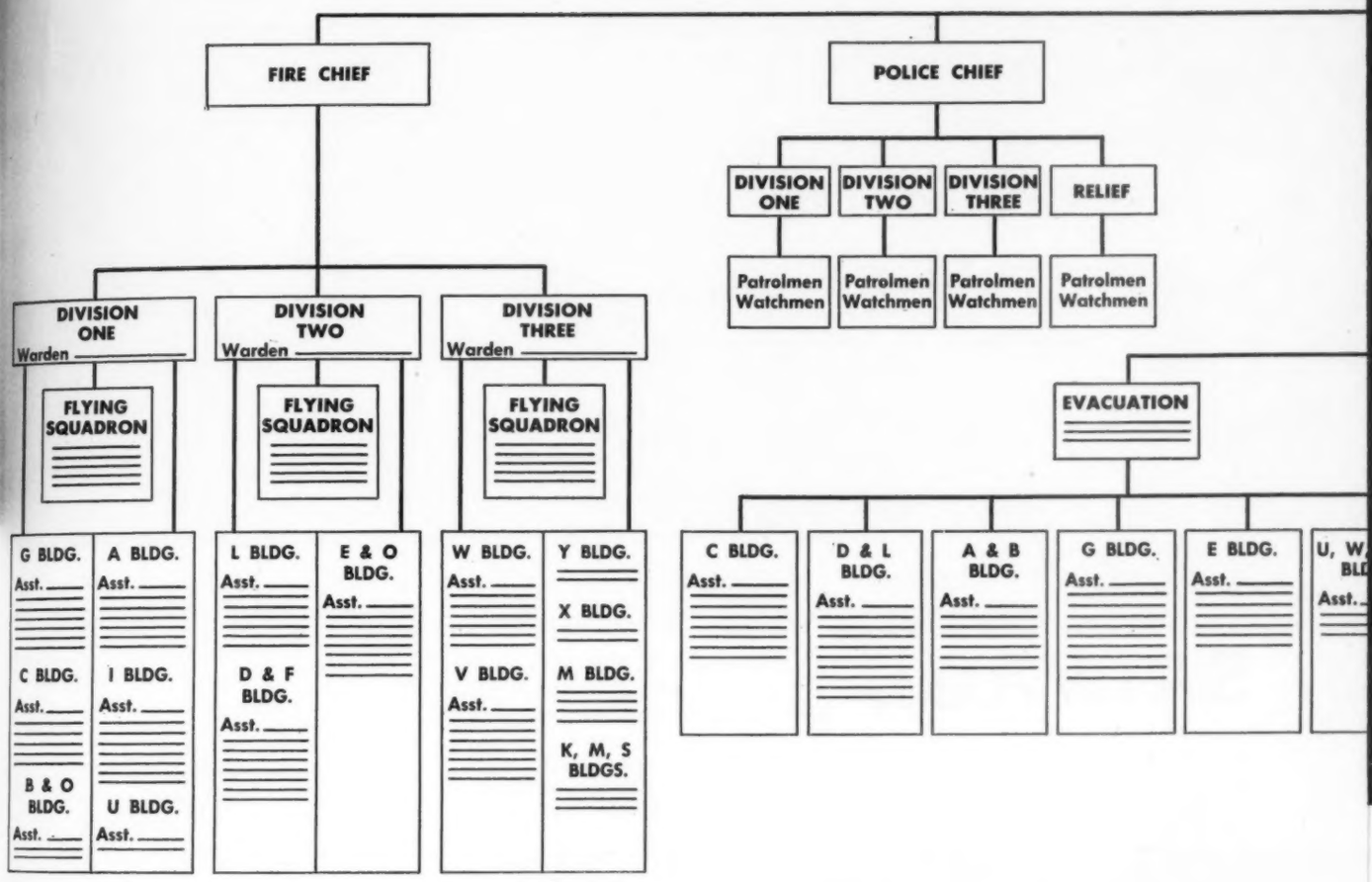
Floodlights have been installed. To eliminate heavy wiring, a pilot control line was run around the plant; in the line are the relays that control the building circuits from which the floodlights get their power. System is operated by a single switch at the main entrance.



All workers use one entrance, must show identification badges

No one gets in without a pass or a proper escort

ARP Organization



Meet the Chief Warden

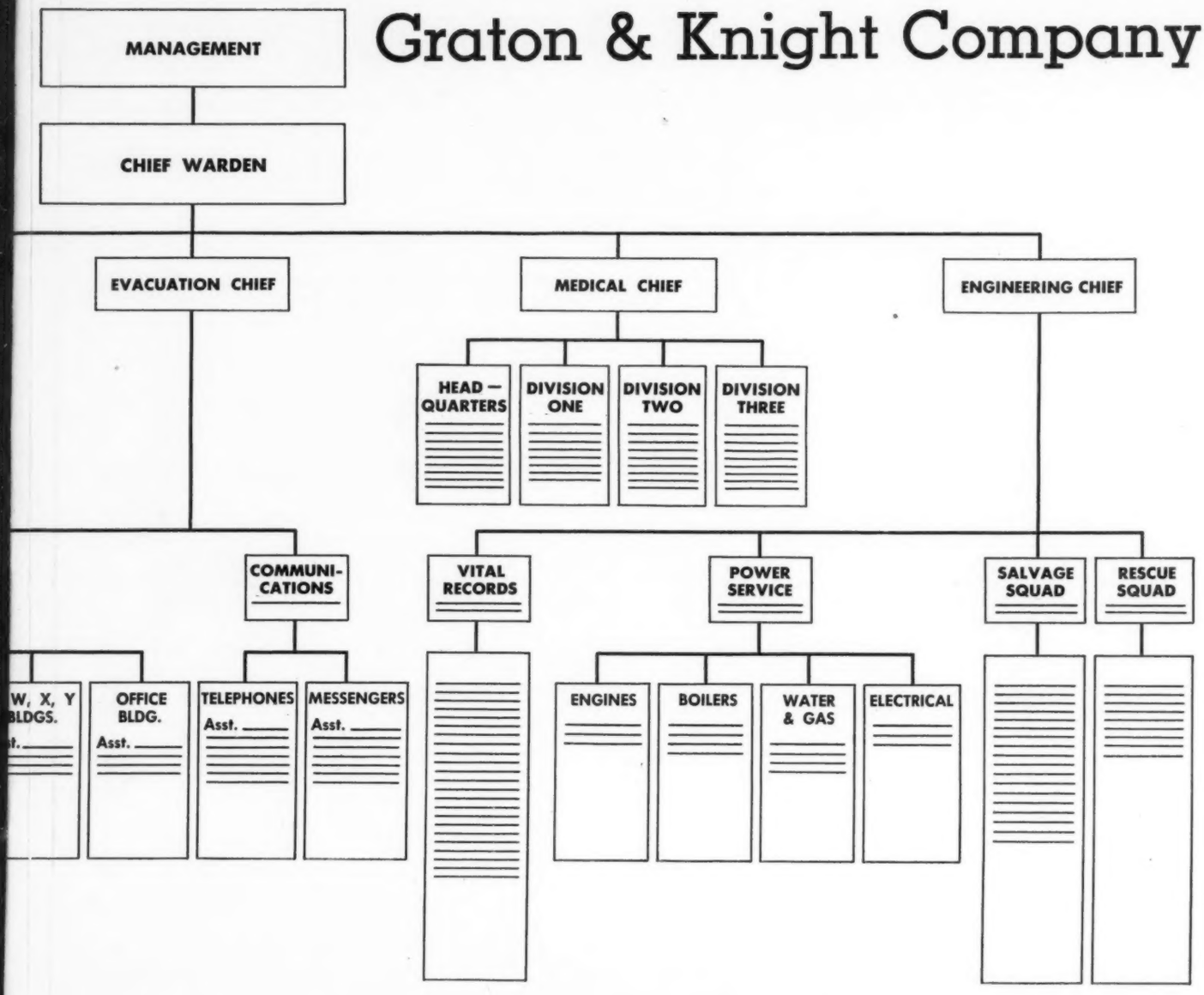
MUCH OF THE SMOOTHNESS with which G&K's plant and equipment operate, must be attributed to William F. Robbins, who has headed the maintenance department since 1932. It was logical to make him chief warden.

Bill completed his formal education with his graduation from high school, but went right on studying, having since completed ICS courses in civil engineering, electrical and mechanical courses at Lowell Institute, also in steam engineering. Member, ASME.

Joined Hood Rubber in 1911, stayed there 21 years, winding up as chief engineer and master mechanic. Found time to serve in the cavalry of the Massachusetts Volunteer Militia, and as first sergeant in the State Guard during the first World War. On the governor's staff during the famous Boston police strike that sent Calvin Coolidge to the White House.

As chief warden, Bill Robbins emphasizes the low cost of setting up his ARP organization. All the equipment will be salvaged for peacetime use, he says, and the services used in any emergency that may arise.

Graton & Knight Company



EVACUATION

THE EVACUATION DIVISION at G&K is in charge of the office manager. Under him, in each factory building, is an evacuation warden with an assistant warden on each floor.

Employees are assigned to basement shelters by buildings. On the alarm each worker shuts down his machine, puts out his light, and, under the direction of the assistant warden on the floor, proceeds quickly and quietly to the appointed shelter.

Paths of travel are so arranged that all evacuees are moving in the same direction, each group of people descending to shelters by a designated stairway.

The assistant warden checks toilets and restrooms on his floor to be sure that all employees have been evacuated, and then reports to the building warden, who in turn notifies the evacuation chief in the control center that the building is empty.

Right, a group of girls from the main office relax in their shelter during a drill.

FIRST AID

FORTY MEN—four sections of ten men each—comprise the first aid group of the ARP organization. This group is set up under the leadership of the male nurse on duty during the day at the factory hospital. The group is supervised by the company doctor who is to return to the plant in the event of a raid. The headquarters section is stationed at the hospital; the other three sections are in the plant, covering the same areas as the mobile fire squads.

The group was trained by two representatives from the local chapter of the Red Cross, who came to the plant one night a week for ten weeks and held a two-hour session after working hours.

The plant hospital was already well equipped. We had only to buy extra stretchers, splints, blankets, etc. Gauze for surgical dressings was purchased by the company and delivered to the local chapter of the Red Cross, where the dressings were made by a group of volunteer women workers. At the city's request the company has allocated space to be used as a field station for the neighborhood—to be manned by the city's own medical organization.

EQUIPMENT

12 stretchers
25 woolen blankets
50 wood splints
4000 surgical dressings

First aid is organized under the leadership of the male nurse who reports to the company doctor. Here, nurse treats a minor burn

Artificial respiration is given on the spot to "victim" who has been overcome by smoke while trying to handle an incendiary bomb

CONTINUED ON NEXT PAGE

Two first-aiders get equipment from one of the six stations

Power service crew is made up of trained maintenance men ready to handle any air raid emergency

POWER SERVICES

EQUIPMENT

One portable truck equipped with:

- 6 pipe wrenches—2 each 12, 14, 25 in.
- 2 pairs pliers—1 6-in., 1 8-in.
- 2 screwdrivers—1 4-in., 1 8-in.
- 1 adjustable hacksaw frame
- 12 hacksaw blades
- 2 10-in. adjustable wrenches
- 2 pairs rubber gloves
- 2 pairs asbestos gloves
- 2 pairs rubber boots
- 1 lineman's rubber blanket (10,000 volts)
- 1 waterproof searchlight
- 6 non-breakable flashlights
- 12 safety tags—"Do Not Touch"
- 12 safety tags—"Do Not Open"
- 12 safety tags—"Do Not Close"
- 6 smoke masks

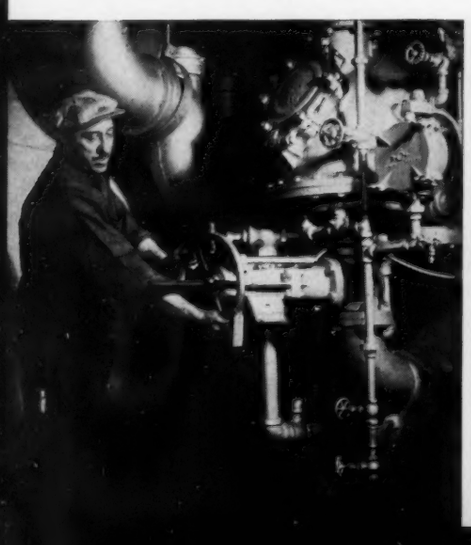
HEADED by the assistant foreman piper, the power service squad is composed of pipers, electricians, and the entire personnel of the engine and boiler rooms. The squad is responsible for engine, boiler, air, water, gas, and electrical services.

All main valves, switches, and shut-offs are numbered and tagged. Each man is assigned specific duties in a daylight raid. On hearing the alarm he closes the valves he is responsible for, removes tags, returns them to the power service foreman, stands by for further orders. When all tasks have been performed, and all tags returned, the foreman turns them over to the engineering chief in the control center. Should experience prove that it is wiser to keep all services in operation until necessary to have them shut off, the squad will report to the foreman on an alarm and stand by for orders.

Boiler room equipment consists primarily of four 300-hp. boilers with underfeed stokers, and one 150-hp. boiler and the usual auxiliaries.

When an alarm sounds, the foreman on duty: (1) Stops stokers; (2) stops

Every member of power service squad has a specific task to perform. Man at left is closing valve. The engine-room foreman (center) shuts down diesels, and the electrician on duty reduces the d.c. voltage



draft fans; (3) opens fire doors; (4) takes numbered tags showing that these tasks have been performed to foreman of power service group; (5) returns to boiler room and stands by to close main valves to factory in case damage occurs to steam lines.

Equipment in the engine room consists of one 900-hp. Corliss engine belted to one 50-kw. and one 100-kw. d.c. generator, two air compressors, and the main factory shafting; one Ball engine connected to a 100-kw. d.c. generator; and eight 120-hp. diesel engines belted to a main lineshaft.

On an alarm the engineer on duty: (1) Stops diesels; (2) stops ammonia compressors and circulating pumps; (3) reduces voltage on d.c. board to 50 volts and places entire load on Ball engine (this permits Corliss engine to be stopped and also dims lights); (4) stops Corliss and stands by to stop Ball engine on order.

During night raids the engine and boiler room forces function exactly as in the daytime, since these services are operated 24 hours a day. Each of the other men on the squad has been trained in his own task and every other task as well. If the men return to the plant at night, they perform the tasks in order. This is assured by a board at the control center that has a list of tasks numbered in the order in which they are to be performed. The first man takes the first task, performs it, returns the tag to the board, proceeds to the next. This assures proper procedure at night even though only a few of the men of the squad are able to reach the plant.

The power service squad has a portable truck with equipment necessary for emergency work. Like other ARP trucks it is equipped with handles so that the squad can carry it up or down stairs when the power is off.

RESCUE

THE RESCUE SQUAD is under the direction of the foreman piper and consists of two millwrights, one electrician, two electric truck operators, one piper, one welder, two amateur weight lifters and wrestlers.

Their function is to perform any rescue service necessary. They have two portable trucks well equipped, also the use of two electric lift trucks and a portable gas cutting outfit.

On an alarm, one of the electric trucks is placed on the top floor of the main building, the second truck on the floor below, so that they will be available to pull wreckage if their help is needed. The operators report to the foreman of the squad. The welder reports with his cutting outfit.

Should evacuation be completed without need of rescue squad service, the men stand by to assist the fire, salvage, and other squads, as directed by the chief warden.

The electric trucks are left on the two top floors so that they may be available to assist the rescue squad by pulling wreckage if necessary.

Squad is in two sections, each with its own truck and equipment.

EQUIPMENT

Two portable trucks, each equipped with:

1 sledgehammer
1 I-beam clamp with ring for falls
1 ½-in. wire sling with thimble
1 10-in. adjustable wrench
3 wire clamps
1 5-ton wagon jack
2 6-ft. crowbars
1 fireman's axe
3 1-in. rope straps, 20 feet long
1 50-ft. rope, ½-in. diameter
1 tackle, ¾-in. rope
1 chain fall—car door puller type
1 wood timber clamp with ring for falls
1 peavey
1 block and falls, 1-in. rope
2 1-in. rope slings, 20 feet long
1 snatch block for 1-in. rope
1 waterproof searchlight
1 adjustable hacksaw frame
12 hacksaw blades
6 non-breakable flashlights
1 3½-ft. single-handle crosscut saw
1 portable acetylene cutting outfit

Rescue squad, in practice, had to extricate a dummy named Oscar from this pile of debris. Stuffed with old light bulbs, Oscar had to be handled with care. He was. The rescue was made without a single pop

Salvage squad gets out waterproof covers for machines and materials

SALVAGE

ORGANIZED under the assistant foreman of the loading gang or freight handlers, the salvage squad is made up of that gang and janitors. It is in two sections, each with its portable truck and equipment. These men cover machinery and materials to protect them from water damage, and clean up after a raid. In a day raid they report to their stations. At night as many as possible return to the factory and stand by for orders.

EQUIPMENT

Two portable trucks, each equipped with:

12 waterproof salvage covers, 9x12 feet
3 squeegees
3 brooms
3 scoop shovels
3 pairs of rubber boots
1 waterproof searchlight
3 non-breakable flashlights
3 smoke masks

Also one metal-lined truck for sawdust

VITAL RECORDS

COMPOSED entirely of office personnel, both male and female, this squad puts away all vital records—ledgers, journals, bills, invoices, etc.—before going to shelters. It is headed by the production manager.

Each office floor is in charge of an assistant. At the alarm the assistants see that designated employees carry all records to the vaults and then send these people to the shelters in the basement of the office building. Each floor assistant reports to his superior who in turn notifies the engineering chief at the control center.

The vital records division does not need to function at night; all records are stored in the vaults when the employees leave for home.

Fire chief instructs a small group of his men in the right and the wrong ways to handle extinguishers

DRILLS AND INSTRUCTION

EACH DIVISION has its own special functions. Instruction and drills in the preliminary stages were therefore planned for small groups. For example, the men in the fire department were instructed in the use of all types of extinguishers, sandbags, and the stirrup pump method of handling incendiary bombs. Spotters were taken to their respective stations and drilled.

As soon as the three fire divisions had been trained, the entire group was shown a film on how incendiaries are handled in Britain.

Then the whole fire department was drilled as a unit. The bell for starting work after the lunch hour was used as a signal. When the bell rang, each fireman took his station, the building wardens reported to the division warden who in turn reported to the fire chief at the control center. Each drill took only a few minutes.

Similarly, the power service men were drilled and instructed by squads, and later as a unit.

To give the rescue squad an idea of what might happen, a dummy subsequently named Oscar was made out of jumper and overalls stuffed with burned-out electric light bulbs. Oscar was covered with timbers, round hoops, galvanized iron, meshed wire, bricks, and general debris. Problem was to rescue Oscar without cracking a bulb. This meant unusually careful handling, and to the credit of the rescue chief and his gang it may be said that the extrication was achieved without a single pop.

Special instruction in the use of covers was needed for the salvage squad. The superintendent of the city fire patrol came to the plant himself, showed the men how to use the salvage covers to protect machinery and materials, how to dry them, and how to roll them and put them away in the portable trucks.

When all divisions had been properly instructed, an air raid drill for the entire plant was staged. This went off satisfactorily, although the time taken by some sections in reporting to the control center was somewhat longer than in the individual drills. Investigation showed that the signal system was inadequate; employees in some sections of the plant were not hearing the alarm immediately.

A loudspeaker system, which had been in successful operation in the office building for some time, has

now been extended to the entire plant. An oscillator was installed at the telephone switchboard from which the call system is controlled, and a high-pitched tone sent through on the regulation five short signals has been found more effective than the human voice.

An added advantage of the loudspeaker system is that messages may be sent out from the control center.

Elapsed time in the general drill was 5 minutes and 20 seconds. On the basis of individual drills, this can be reduced by further practice to about 3½ minutes. Thus, if we have 4 minutes' warning, the employees assigned to specific tasks will be in their proper places, the vital records will be in the vaults, and people who have no specific duties will be in the shelters.

Our control center is a small room about 8x12 feet on the second floor of a building in the center of the plant. Two sides are formed by brick walls, the other two by plywood panels. In this room are kept plans of the plant, also all information regarding raids, blackouts, etc. It is equipped with PBX telephones as well as a direct line to the city control center.

Once more it should be emphasized that the cost of setting up our ARP organization has been small. The portable trucks, as previously mentioned, were made in our own shop. Trucks and equipment will find peacetime uses. And the various divisions will function in any emergency. Air raids or no air raids, the organization is sure to pay dividends.

Trucks have handles, so ARP squads can carry them up and down stairs when power is off and elevators are not running

Two members of the fire division get acquainted with a hose mask under the watchful eye of their chief

Long lines of cold-cathode fluorescent tube provide all the light needed in this West Coast plant

What Cold-Cathode Fluorescent Lighting Is

It's a half-brother of the glowing tubes so widely used nowadays but differs from them in several important respects, one of which is operation at high voltage

DEVELOPMENTS over the past few years have given industry another type or form of fluorescent lighting, designated as cold cathode. There are important points of resemblance to the popular and well-known hot-cathode type, along with notable differences in the design of the tube and method of operation.

First off it should be noted that most of the fluorescent lighting so widely used everywhere is produced by so-called hot cathode tubes. These tubes are designed to operate on the conventional lighting circuit. Commercial fluorescent lamps are essentially low-pressure mercury lamps designed to emit a maximum proportion of their energy at a certain wave-length of the mercury spectrum. Only a comparatively small amount of visible light is given off by the arc itself. The lamp is coated on the inside, however, with a material known as a phosphor, which glows when subjected to the ultraviolet radiations produced by the mercury arc. The color of the resultant light is determined by the phosphor or mixture of phosphors used. Each of the materials used for this purpose glows with a characteristic color. Hence it is possible to obtain a large number of different colors and shades.

The lamp contains a small amount of mercury and some gas, usually argon under low pressure, to assist in starting the arc.

In order to produce the low-voltage arc discharge through these lamps it is necessary to heat the oxide-coated cathodes for a few seconds. An automatic starting switch allows current, whose magnitude is limited by a ballast, to flow momentarily through the cathode. Then the switch opens, causing an inductive surge that starts the arc.

Substantially the same end result

can be accomplished by applying to a similarly constructed tube a sufficiently high voltage to strike and maintain an arc. The cold-cathode fluorescent lamp is based on that principle.

Basically these lamps are not a new development. The fact that light can be produced by passing a high voltage through a tube containing a small amount of some gas has been known for many years. High-voltage luminous tube signs—neon for example—have been widely used for a quarter-century or more. The output of light produced by uncoated tubes is low, however, and they found application primarily only in decorative illumination.

Recently coatings of fluorescent material such as are used in hot-cathode fluorescent lamps have been applied to high-voltage tubes, resulting in the production of a light source that is suitable for general illumination. To foster the development and application of cold-cathode fluorescent lighting the Fluorescent Lighting Association was launched a short time ago. Its members are manufacturers of parts used in this type of lighting equipment.

Cold-cathode fluorescent lighting installations are essentially custom built. The tubes may be made in any desired shape and in any length from about 3 to 10 feet. If necessary, approximately 120 feet of tubing can be lighted by one transformer, although with large tubing 40 feet is a more common figure. Light output per foot of tube is governed by the diameter of the tube and the current input. It is therefore possible to produce almost any desired intensity by varying one or both of these factors.

Tubing commonly used ranges from 12 to 25 millimeters in diameter, or roughly ½ to 1 inch.

Individual lengths of tubing usually range from about 4 to 8 feet. They are connected in series across the secondary of a high-voltage transformer. No starting switches are employed since it is not necessary to preheat the cathodes, and only one connection is made to each end of the tube. The number of feet of tubing that can be lighted from one transformer depends on the open-circuit voltage of the secondary. That will vary from approximately 1000 to 7500 volts or more.

As would be expected in view of the high voltage used, the current flow through cold cathode tubing is comparatively small, ranging from 30 to approximately 120 milliamperes.

Efficiency of a cold-cathode fluorescent tube increases with decreased current density. It increases also with increased length. This is due to the fact that the comparatively high voltage drop of the electrodes, ranging from 125 to 200 volts per pair, becomes proportionately smaller to the voltage drop through the tube as its length increases.

Like other forms of lighting the cold-cathode fluorescent variety has its strong and its weak points. In general, cold-cathode lamps have a lower lumen-per-watt output than the hot-cathode, but higher than that obtained with incandescent lamps.

Installation cost is higher than for conventional fluorescent lighting, with a still greater disparity over the cost of incandescent installations.

On the other hand, the rated life of cold-cathode tubes is from 10,000 to 20,000 hours. Aside from the transformer no auxiliary equipment is required. It is claimed that tube life is not notably reduced by frequent starting or fluctuating line voltage. Also that a tube will start and operate at temperatures lower than can be withstood by hot-cathode tubes, although the light output falls off materially when the ambient temperature falls to the freezing point or below.

Protographs by courtesy of Electrical Products Consolidated, Seattle, Wash.

Even distribution of light is apparent in this corner of the plant shown in the preceding illustration

Scheduled Lubrication Saves Oil, Machinery, and Time

How a plant changed from the hit-and-miss method of having operators oil their own machines to a strict, well-planned lubricating schedule, thereby saving lubricants and operators' productive time, and preventing machine breakdowns

J. L. LOONEY, Plant Supervisor, American Maize-Products Company, Roby, Ind.

ADEQUATE LUBRICATION of individual machines or groups of equipment may well be a relatively simple matter requiring little planning. But when thousands of diversified units scattered over a large plant are involved, well-planned and systematic lubrication is not so simple as a casual consideration might indicate. This is especially true when conditions require equipment having almost every type of bearing surface, and operations involve temperatures ranging from perhaps 20 degrees below zero to that of superheated steam, as in the Roby, Ind., plant of the American Maize-Products Company.

In this plant, which manufactures a large range of corn products, varying from finely powdered dry materials to viscous liquids, there are upward of 20,000 points at which lubricants have to be applied with a reasonable degree of regularity, because the failure of one piece of equipment can tie up a whole department or even the entire plant. It becomes essential, both for economy and for assurance of continuous operation, to apply the right lubricant, in the right place, at the right time.

Some years ago plans called for giving each department supplies of the lubricants it needed. They were to be applied as required, usually by men charged primarily with production. Results left much to be desired. Bearings were likely to be either neglected or fed too much lubricant. To overcome these difficulties and to center responsibility for lubrication in the hands of a few trained individuals, it was decided, first to have a survey made by lubrication specialists, and then to work out a procedure to handle the lubrication as conditions demanded.

A large oil company, which has a refinery and research laboratories near the plant, was called in to make the

Author J. L. Looney, whose picture appears at the left above, joined the Roby, Ind., plant of the American Maize-Products Company in 1936, is now plant supervisor. Before then he served for ten years as an industrial consultant, both in this country and abroad

survey. Every piece of equipment was studied and diagramed. Each point needing lubrication was marked and numbered on the diagram. Then, on a corresponding sheet, for each numbered location the type of lubricant deemed best suited and the frequency of application considered necessary were noted.

Of course such important factors as operating temperature, type of bearing, speed of shaft or other moving part, method of applying lubricant, type of lubricating device, and total operating time per day were given due consideration. The report devoted a page to each machine or group of machines, and so constituted a large volume. But it made the basis of the plan later put into effect.

Fewer Types of Lubricants

The oil company's recommendations regarding the types of lubricants to be used were followed in most instances, but where experience of the plant engineers indicated that another make or type of lubricant gives better results, it is being used. For simplicity and economy in applying lubricants, however, the number of types has been reduced to the minimum consistent with adequate results.

Having thus decided upon a plan for lubrication, it was necessary to work out a detailed procedure for putting the plan in effect. This demanded, initially, a detailed time study of every piece of equipment which required lubrication. Since a plan, termed the "point plan" had been used throughout the plant as an index of labor utilization, it was decided to establish routes in such a way that oilers would be engaged on an 80-point hour, the rate of productivity aimed at under the point system. One piece of equipment might require one hour for lubrication according to the specification set up, whereas many other units might be lubricated completely in the same time, yet at all times the oiler would be required to perform at the prescribed 80-point hour rate. A premium is paid, however, to oilers who exceed a 60-point hour performance rate. The routes were so laid out that the 80-point hour rate is a maximum. Experience indicates that when oilers are loaded to exceed this rate, a chance of slighting some elements in the lubricating schedule exists.

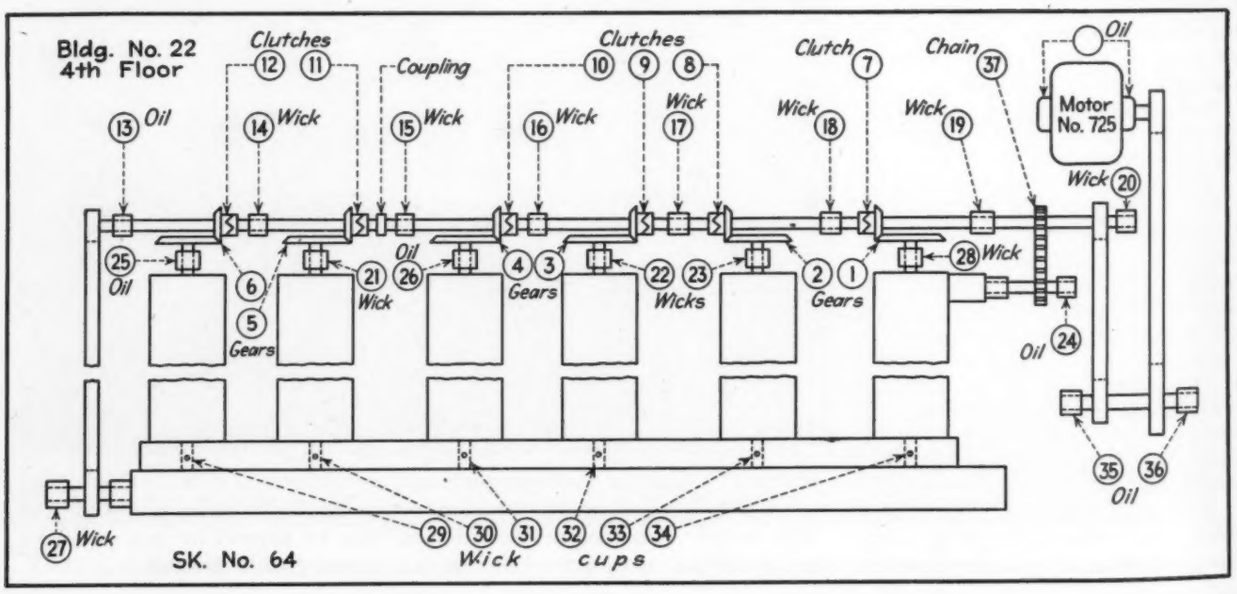
After establishing the rate, it was necessary to work out a route and schedule for each of the oilers. To do this, a plan of the entire plant, showing the location of each piece of equipment needing lubrication, was made.

Regular Routes for Oilers

From this, in combination with the diagrams of each piece of equipment previously made, routes were laid out. It was found that five men working eight hours a day under the supervision of a foreman, could cover each point with the necessary frequency. The routes require that each oiler cover a certain number of points where lubrication is needed once each day, a certain number that need attention once, twice, or thrice a week, another number that need attention once or more times a month, and so forth, until all points on the route are covered within a given interval. The foreman must make suitable checks to be sure that the work is done, and must see that oilers are supplied with the various lubricants and equipment needed. Units such as gear reducers, of which many are in use, usually have closed cases in which oil may need changing only once in three to six months, but some such jobs have to be done each week or month, and involve flushing out spent oil with petroleum spirits and applying new oil. Somewhat "special" lubricating jobs, such as that on gear reducers and other important equipment, are handled by the head oiler or foreman.

Oilers Report Trouble

Besides lubricating, the oiler must keep bearings clean and report daily to the maintenance engineer any bearings that show signs of misalignment, excessive wear, or incipient failure, as indicated by excessive oil consumption or by a tendency to overheat. A special form is used for such reports. This, of course, aids the maintenance department in keeping track of equipment and in avoiding or minimizing failures that might result in breakdowns and avoidable stoppages in departments that should maintain continuous operation. Since in this plant there is a continuous flow of materials in process from the corn elevators to the finished products, a serious bearing failure in any of the



primary departments could shut down the entire plant.

Among the many types of equipment in the plant there are some 1600 pumps, most of them with direct motor drive, and a much larger number of individual motors driving other types of equipment such as slow speed cylinder driers, centrifuges which run at speeds up to 18,000 r.p.m., gears that turn at a wide range of different speeds, many types of reciprocating equipment, such as air compressors, steam engines, and vacuum pumps; numerous types of conveyors; grinding and sifting equipment; mechanically actuated driers and presses; intricate packaging machines; and a great variety of specialized equipment. There is also much steam-generating equipment, requiring stokers, blowers, and coal pulverizers, and power-generating equipment, including turbines and reciprocating engines.

Many Lubricating Devices

With this diversity of equipment, it is not surprising to find many types of lubricating devices. They include ring oilers, bottle oilers, wick oilers, and mechanical oilers driven by the machine and arranged to feed a predetermined quantity of oil to each of the points served. Much of the equipment is furnished with lubricating devices already in place or built in, hence nearly every type of lubricating device has to be serviced. The oiler must supply each device with the right grade and quantity of oil, as specified by the diagram to which he has access until he had memorized the details to be observed. Many bearings, of course, are arranged for grease rather than oil lubrication, and most of these points are equipped with pressure fittings. To service these points, the oiler carries two hand-operated pressure guns, each with a different grade of grease. In addition, he makes use, especially on large bearings, of a portable motor-operated pressure gun. This is not carried about through the whole route covered, of course, but is available where needed, and especially where a hand gun is not adequate for the particular job.

Carry Tools With Them

Oilers regularly carry two oilcans, one for light machine oil and one for cylinder oil. They are provided also with such simple tools as a small pipe-wrench, an adjustable open-end wrench, a screwdriver, and a flash-lamp. When a ladder is required to reach overhead bearings, as on line shafts or conveyors, one is available in the building or department where it is needed.

Since oilers cover a precisely prescribed route each day (though it varies from day to day except for bearings needing daily attention) they soon learn what is required and, if any special equipment or special lubricant is needed, they bring it to the required points at specified intervals. As the whole plan has been well thought out, it requires only a minimum of supervision, once the oilers have learned what is required.

Whether or not there is any saving in direct labor, is not easy to say, as production employees have been relieved of lubricating duties and presumably spend the same time in productive efforts. The oilers tend only to the job of oiling, and certainly do it more efficiently than those trained for other work. It is certain that better over-all lubrication results, which is being reflected in reduced maintenance costs and down time for equipment. In other words, any temporary increase in payroll for lubrication work is much more than offset by lower maintenance costs and reduced interruptions in production schedules. This leads to the conclusion that the over-all gain is substantial and that efforts required to work out a good system of lubrication and put it into effect have been well worth while.

Cost Reduced

In addition, a substantial saving has been made in the cost of lubricants employed per thousand bushels of corn ground and subsequently processed. On this there are definite figures, which show that in 1938, the year before the present plan of lubrication was put into effect, the cost of lubricants per thousand bushels of corn processed was nearly 30 percent higher than in 1941. Or, to state the matter in another way, the cost of lubricants in 1941 shows a reduction, per thousand bushels processed, of nearly 23 percent of the 1938 cost—a not inconsiderable saving in addition to that realized by reduced maintenance and less down time for equipment.

Every piece of equipment was diagramed (facing page), each point needing lubrication marked. On a corresponding sheet (below) were noted the type of lubricant and the frequency of application

SKETCH NO. 64
BLDG. NO. 22

BEARING	HEAT CONDITION	TYPE & MAKE OF BEARING	OPERATION: CONSTANT	OPERATION: INTERMITTENT	KIND OF LUBRICANT	TYPE OF FITTING	LUBRICATION FREQUENCY: NUMBER OF DAYS PER OCCURRENCE	INSPECT AND CLEAN
Motor	F	Ring Oil	✓		Arctic Motor Oil	Plug	7	
1 to 6		Gears			Axle Grease	--	7	
7 to 12		Clutch			Cylinder Oil	--	7	
13 to 34		Pillow Block			Engine Oil	Wick Cup	7	
35 to 36		Ring Oil Post Hanger			Engine Oil	Bottle Oiler	14	2 months
37		Chain			Cylinder Oil		7	

Incentives Cut Wiring Costs

Better control of costs, more money for the men, increased efficiency in handling the work—all brought about by payment on an incentive basis

C. H. BRECHIN and P. M. MATTHEWS, Factory Service Division, Westinghouse Electric & Manufacturing Company, East Pittsburgh

AN INCENTIVE PLAN for all electrical maintenance work has resulted in several important advantages — among them a decided decrease in the cost of supervision and increased earnings for the men, through better performance.

In establishing this incentive plan extensive time studies covering all phases of the work were necessary, so that definite constants and variables could be measured and associated with the details of installation. For example, size of conduit used, number of feet required, necessary offsets, type of installation (whether overhead or underground), method of support, size of wire, and installation of switches have a definite bearing on the amount of time required. These factors were evaluated and a standard method for performing the different operations formulated.

The various grades of electrical work covered include:

(1) Low- and high-voltage wiring; (2) lighting installations; (3) installation of test floors and testing equipment; (4) installation of machine tool equipment; (5) wiring cranes and elevators; (6) building such items as cabinets, junction boxes, panelboards.

A definite system for handling the work has been put into practice. On new work the engineering department issues the necessary information, such as wiring diagrams and layouts, location of job, engineering data, materials needed, and the type of equipment to be used. This information is dispatched to the group leader by the foreman. The group leader in turn discusses the job in detail with the time study man, who determines what work is to be done and what methods are to be employed.

After analyzing the job in detail the time study man works out the time values from formulas and standard information that have been compiled from previous time studies and records. Time allowances in general are made for the following:

1. *Set-up.* Covers the time necessary to gather the necessary equipment on the job.

2. *Switches and Controls.* This allowance is for the time necessary to lay out and drill for mounting.

3. *Installation of Conduit.* Includes the time necessary for the installation of conduit from switches to bus lines and from switches to controls and motors.

4. *Wiring.* Covers the time necessary to install wire, and is based on the size of wire needed and amount to be used, possible difficulties in pulling wire in due to offsets and bends, and making connections to switches, controls, and motors.

5. *Equipment.* Time necessary for installation of breakers, cabinets, starters, panels, pushbuttons. Influencing factors are size of equipment and method of mounting.

6. *Connections.* Time necessary to make power connections. With a complicated job where numerous control wires are used, time is allowed for tracing and ringing out the different circuits. Where the work is extremely hazardous and difficult, additional time must be allowed for safety reasons.

7. *Disposal of Equipment, Tools, and Surplus Materials.* Under this allowance is totaled the time necessary to remove all surplus materials from the site. All old materials must be delivered to the salvage department, and all excess new materials taken back to the storeroom. Ladders, scaffolds and other equipment must be returned to the toolroom.

8. *Group Leaders' Duties.* This allowance covers the time necessary for group leaders' duties, such as getting necessary information and engineering data, taking care of time, and supervision of work. The time allowed is usually a flat percentage.

Equipment and supplies are transported in sturdy wheeled toolboxes

After arriving at the time allowance the time study man issues a time contract to the group leader, who in turn passes the time allowed on to the workmen. If changes or unusual difficulties are encountered, the group leader consults the time study man, who goes over the job again and makes due allowances for the alterations.

Since establishing an incentive system for electrical work several changes have been made throughout the department that have helped to increase production. Some of the specially noteworthy changes include:

1. Box-type tool kits have been mounted on four-wheel trucks. These trucks can be transported by hand to any location. A steel plate was fastened to the top of the tool box, and a machine vise and a pipe vise installed on it. Hardware, supplies, tools, and equipment are carried inside the tool box.

2. Standardizing conduit fittings.

3. Improved scaffolding equipment.

All the men working on each job pool their earnings on a job contract basis. The group leader charges his time to each job in proportion to the time allowance previously discussed. In this way the group leader can shift his men from one job to another as required and obtain top performance. The men, on the other hand, enjoy earnings consistent with their performance on each job.

It is particularly interesting to note that the men working under this system attempt to arrange their work so that they will have a minimum of lost time on changing from one job to another. Under the daywork system there was no incentive to get the work done efficiently and it was difficult for the foremen to control the performance on each job. Now the men inform the group leader as to when they expect to complete a job so that he can have their next one laid out.

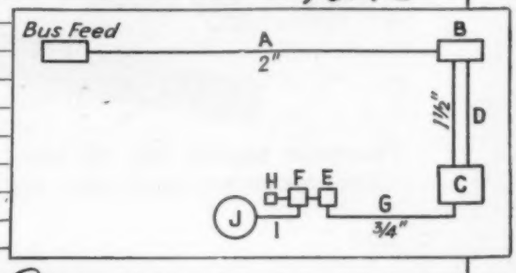
This sheet shows the standard times allowed for each operation. Here the job involves wiring a machine

*Form 3744-L—W. E. & M. Co. Works Dept.—Printed in U.S.A.

SHEET Nº 1 **STANDARD TIME** Routing No.

Dwg. Title FIGURE Nº 1	Sec. L-62 CONTRACT 586	Dwg. No.	Sub.
Part SECTION A-10	Ins. Spec.	CHARGE E 10241-3	
Mtl. Size Pcs. per 100 lbs.	Die Mould	L. Spec.	Sub.
Mach. Tool and No.	Spec. Tool or Fixture	STANDARD TIME: Set Up	Each Piece
Operation WIRE MACHINE E#2375	Oprn. No. / Class of Labor / How Set		40.45

FOLLOWING FOR BUS		
INSTALL JUNCTION BOX (B)	1.45	
" 2" CONDUIT (A)	4.00	
" 3 CABLES 4/0 1/6	2.50	
" CABINET (C)	2.50	
" PIPE BETWEEN (B) and (C)	2.04	
PULL WIRE FROM (B) TO (C)	1.00	
CONNECT ON BREAKER	1.70	
MAKE HOT TAPS	2.25	
	18.44	18.44
FOLLOWING FOR MACHINE TOOL		
INSTALL BREAKER (E) and STARTER (F)	2.36	
" PUSH BUTTON (H)	.47	
" FEED PIPE (3/4") (G)	1.20	
" WIRE (SMALL) 3 - #12	1.00	
MAKE CONNECTIONS	2.25	
CUT NIPPLE BETWEEN (E) and (F) and (H)		
PULL WIRE and CONNECT	2.90	
INSTALL MOTOR FEED WIRE (I)		
TO (J)	4.30	
	14.47	14.47
SET UP TOOLS and MATERIALS		3.00
GET LADDERS and RETURN		1.00
WELDER SET UP		1.25
GROUP LEADER'S DUTIES		2.29
		40.45



Recorded—Time Clerk | Cost Clerk | Date | Signed John Doe | Time Study Dept.

A determined Uncle Sam on posters and stickers emphasizes the need for unceasing war on waste

How to Conserve Towels and Tissue

EVEN DURING PEACETIME, Scott Paper Company stressed the need for conserving towels and tissues. Now, through its Washroom Advisory Serice, this company has just begun a greatly intensified war on waste.

Objectives of the drive to conserve paper products are to:

1. Make an active contribution to America's war effort.

2. Establish good washroom habits that will outlive the war.

3. Identify defense plants and other industrial organizations that are cooperating in the conservation crusade.

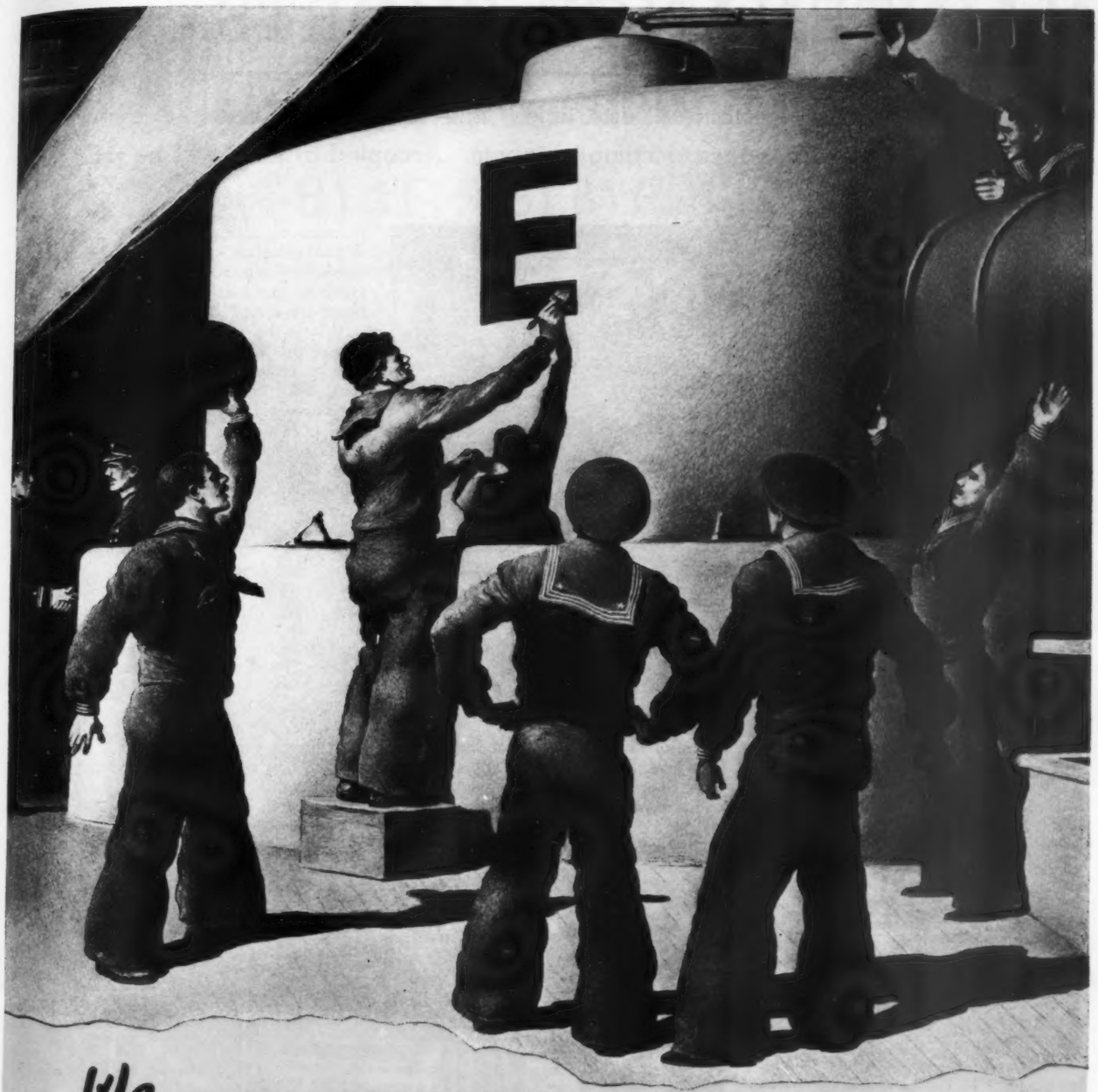
Red - white - and - blue posters and stickers—some of them illustrated by a determined Uncle Sam—conservation literature, plant bulletin board notices, releases to company publications, and other aids to management form the backbone of the campaign. This material, which the plants receive free of charge, is distributed by Scott Paper salesmen.

The educational campaign is not only concerned with towels and tissues, but also offers broad help in saving metals and other materials needed to win the war. Especially helpful is a booklet containing 101 hints.

Four-page booklet lists 101 hints on how to save materials in the office, washroom, production, stores, and shipping departments

CONSERVE WASHROOM SUPPLIES
TOWELS, SOAP AND TISSUES PROTECT YOUR HEALTH
LET US CONSERVE THESE SUPPLIES TO MAKE THEM AVAILABLE AT ALL TIMES
WAR ON WASTE

Examples of posters distributed



We KNOW HOW THEY FELT!

Those men who earned the first Navy E, back in 1906, must have been the proudest crew of tars in the fleet. We know, for we feel the same bursting pride today. The blue Navy burgee now flying from our flagstaff sends a special thrill through every man in our plant. We're proud to be Americans.

The Navy E is not lightly given, nor lightly received. It means more than Excellence. It stands for a good job well done, for teamwork better than the best . . . and its award to any civilian plant should double and redouble fighting spirit. From now until final Victory dawns, we pledge every effort to help *Keep America Rolling.*

Exide
IRONCLAD
BATTERIES

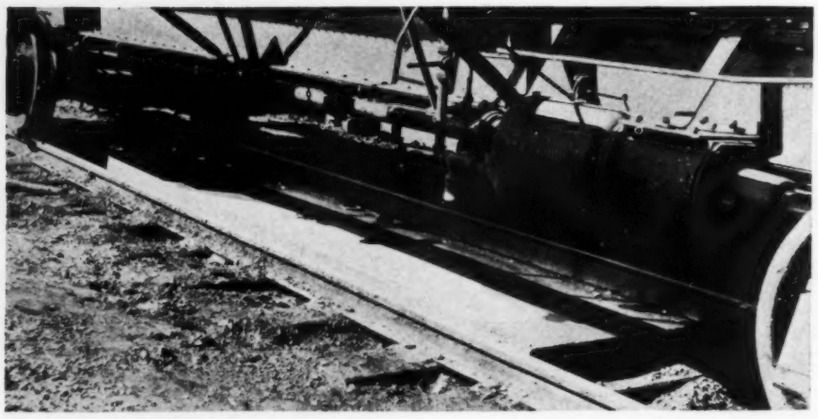
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto

MAINTENANCE SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for



Tie and ballast shift do not strain pipe connections to this drip pan

Track Drip Pans Catch Tank Car Drippings

CHARLES C. LYNDE, Kilgore, Tex.

Where flammable liquids must be handled into or out of tank cars, gradual dripping of the fluids onto the ballast of the railroad siding may create a condition that might easily result in an explosion or disastrous fire.

One manufacturer of volatile naphthas, solvents, and other flammable fluids equips the loading rack track with heavy steel pans, long enough to reach from truck to truck of the tank car, and just narrow enough to escape the wheel flanges. A skived pipe is welded to a companion hole cut through the pan bottom, and connected through self-contained trap and flexible joint to the plant's sump system.

Instead of being bolted or spiked to the crossties of the track, the pan simply rests on them, allowing the track and ballast to shift under train weight without straining pan or sump connections.

When no car is spotted over a pan, the drain is covered with a flat steel top, principally to prevent fouling of the drain by blowing trash. The cover also prevents injury through some employee stepping into the open pipe end.

•

How to Repair Commutators

ED SWAN, Kearny, Neb.

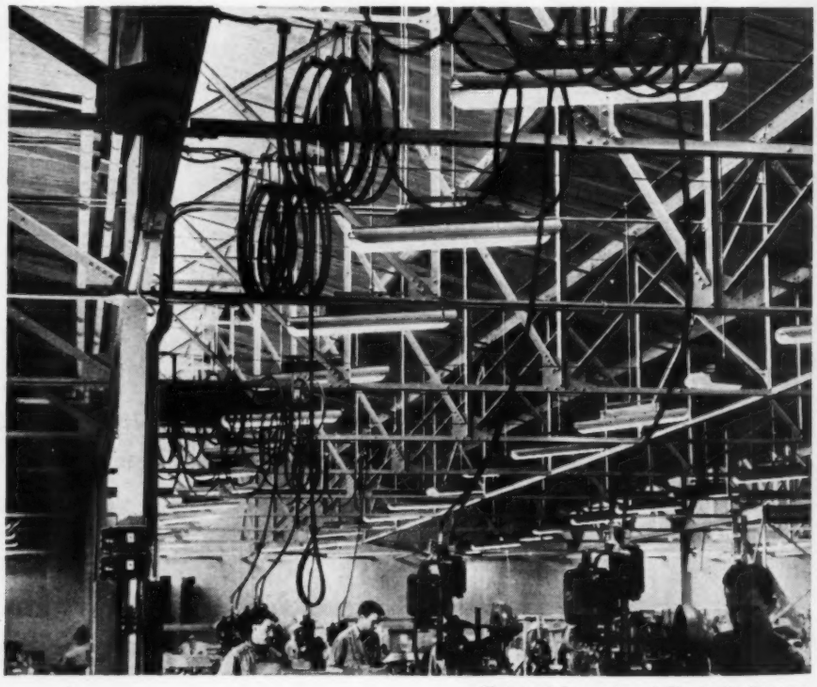
During the present emergency, service and repairmen will have to do more repairing and less replacing of defective parts than in normal times. Commutators are one of these items.

One of the most common faults is the carbonizing of the mica between the bars. Carbonizing makes a partial conductor of the mica with the result that the adjacent bars heat. The leads usually become unsoldered, resulting in arcing between bars and firing around the commutator. Where the carbonization is only on the surface, it can sometimes be cleaned out and a satisfactory repair made by using a good grade of commutator cement, of which there are several on the market.

Where the damage is too extensive for this method of repairing, it will be necessary to remove the plate that holds the bars, gently loosen them, and take out the defective mica plate. Then a new mica plate of exactly the same size and thickness as the old one can be inserted after it has been moistened with a high-grade thin baking varnish.

Much care should be exercised in assembling the commutator again. When tightening, tap it with a hammer, and heat, then tighten again, and do this several times. The whole job will be spoiled if the tightening is not done correctly, because the bars may fly out under centrifugal force, especially at high speed. When the commutator is tight, turn it down in the lathe, removing only the very minimum of copper.

When giving any rewound or repaired armature a running test, if fire follows around the surface of the commutator, stop the machine and feel the bars. When you come to the hot bars the chances are

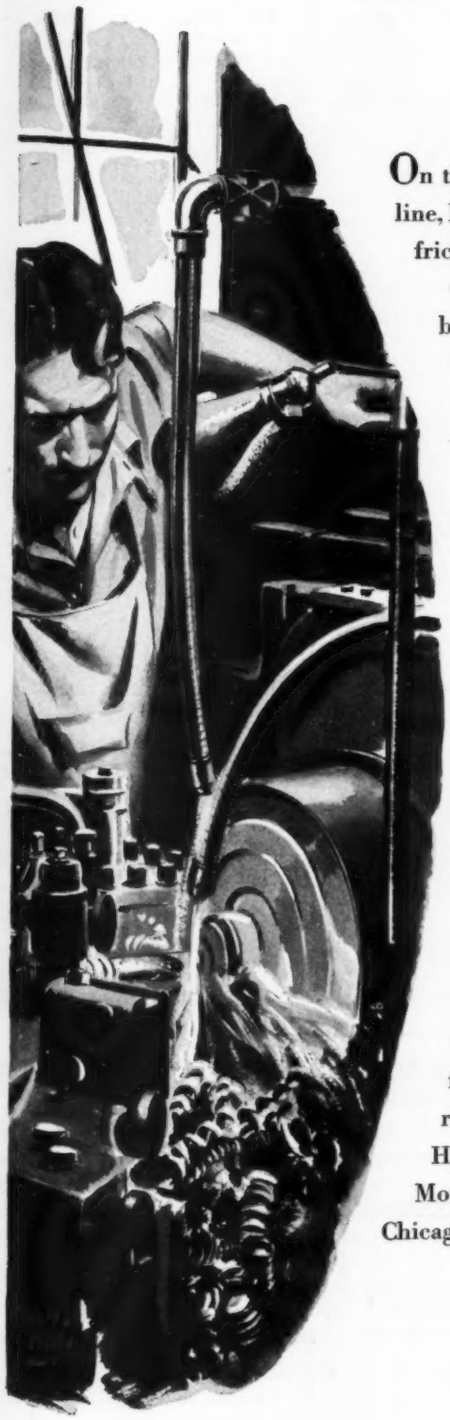


Photograph by courtesy of The Austin Company

In this plant compressed air and electric power are brought to power tools through 60-ft. lengths of hose and flexible cables suspended from small pulleys riding on a 50-ft. messenger wire. This arrangement makes it possible for one tool set-up to serve two tables.

MACHINE RUNNER and THE GUNNER

HYATTS SERVE BOTH



On the production line, as on the firing line, Hyatt Roller Bearings keep fighting friction—keep fighting for America! Correctly designed . . . precision built . . . freeing equipment from bearing wear and care . . . taking the brutal punishment of heavy loads and long hours . . . Hyatt Roller Bearings have carried on in war and peace for a half century, and will continue to serve as well in today's air, land and sea assignments.

And after industry's machines have finished their present war-time production . . . after America's guns have fired their last shots in Victory—Hyatt Roller Bearings will be serving as usual on highway and railway, in mill and factory, in farm and field—keeping things rolling quietly and economically.

Hyatt Bearings Division, General Motors Corporation, Harrison, N. J., Chicago, Detroit, Pittsburgh, San Francisco.

HYATT

THE 50TH YEAR OF ROLLER BEARINGS

that the mica between them is carbonized.

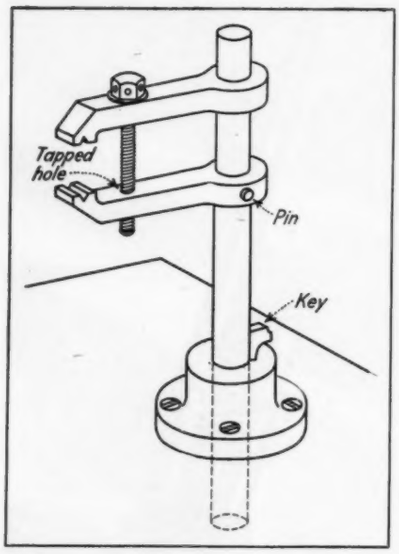
Make sure that any leads that have come loose are carefully cleaned, tinned, and resoldered.

•

Adjustable Vertical Bench Clamp

CHAS. H. WILLEY, Penacook, N. H.

Any maintenance man will recognize the usefulness of this vertical, rugged bench clamp which has a wide opening, and is



mounted so that it can be swung in a circle and raised and lowered to suit one's convenience.

The sketch really tells the story. The lower half of the jaw is stationary and pinned to the post, and has a tapped hole for the clamp-screw. The upper or moving jaw has both its post hole and clamp-screw hole drilled with sufficient clearance for easy slip fit. The key at the base is wedge-shaped, and locks and unlocks the post for adjustment.

•

Crossing Gate That Is Easy to Make

R. A. SHAW, Safety Engineer, The Murray Corporation of America, Detroit

Providing some means of protecting plant roadways at railroad crossings is a common, and sometimes troublesome, problem. The accompanying sketch shows details of a crossing gate which we have found to be comparatively inexpensive and satisfactory from every standpoint. It is intended to be operated by the brakeman.

It consists essentially of a wooden bar or gate of suitable length—we make ours 16 feet long—mounted on a piece of 3-in. pipe 7 feet 6 inches long in such manner that it can easily be swung around. Two depressions are cut in the bottom bearing plate supporting the gate mounting at the top. Corresponding lugs in the bearing plate of the gate assembly fit into these depressions and prevent the gate from swinging in the wind. The purpose of the compression spring is, of course, to insure that the lugs will slip into the depressions and remain there until the gate is forcibly moved by hand.

Since high visibility of crossing gates is essential we follow the customary practice of painting them black and white, in alternate stripes.

•

When a careless employee forgot to close a steam valve tightly, allowing 111,600 pounds of steam to leak away during the night, the flow meter told all about it the next day, and so showed the necessity for taking immediate steps to prevent any repetition of the occurrence.

•

Jumpers Make Conduit Connections Safer

S. H. COLEMAN, Roanoke, Va.

Intelligent grounding of electrical equipment requires the consideration of every factor that may result in either a break or a high-resistance joint which might interfere with travel of current to the earth.

Conduit networks must be installed so that electrically they will have as nearly as possible all the properties of an unbroken primary conductor. To secure this result careful attention must be given to every detail that might by any chance cause an open circuit. Only with such care can danger to personnel and equipment be eliminated.

Special care is needed in grounding conduit systems where explosion hazards prevail. Here it is necessary to eliminate any condition that might possibly cause a flash or spark in the event some circuit becomes grounded. Where the use of locknuts and bushings is permitted, it must be kept in mind that they are often loosened by vibration, creating a decidedly unsafe condition. Therefore considerations of safety dictate the use of jumpers around the danger points, to eliminate any possibility of sparking, or heating due to high resistance.

•

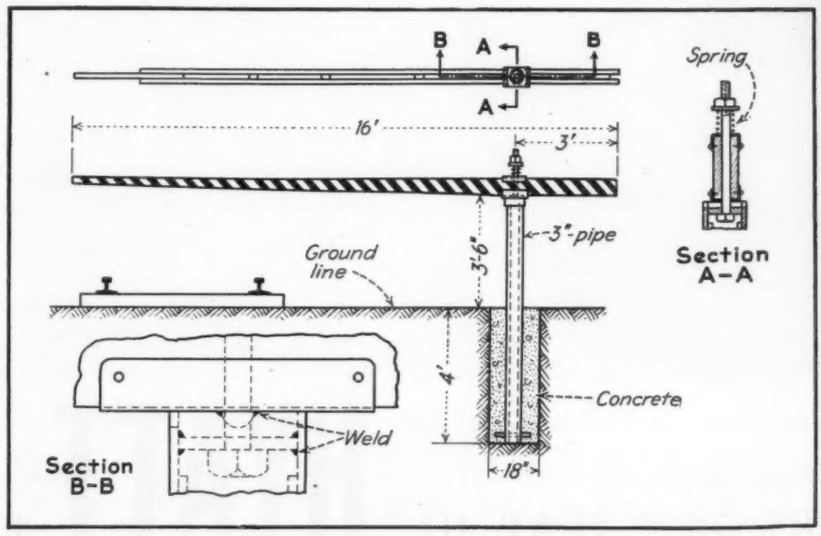
Machine Sticker Lists Speeds, Saves Time

PHILIP F. ATWOOD, Terryville, Conn.

We use a large number of hand-operated machines, such as millers, drillpresses, and lathes. Closer control of machine conditions was insisted upon by the time study engineers who found that in order to duplicate conditions on future set-ups all factors that are controllable should be recorded and made a part of the standard information. The data on file were a bit cumbersome to use because a file was needed listing the revolutions of the machines. This information had to be looked up on the job or the speed had to be checked with an indicator.

We got around this requirement by having a small sticker put on each machine, listing the various operating speeds. The sticker is put in a conspicuous place, easy for the set-up man to use. The time study man, too, can readily find and record the machine speed as part of the rate data.

We find this scheme is particularly helpful now, since some of our set-up men, foremen, and time study men are new



Crowding the turns can mean trouble in piping, too!

When they're riding hell-bent for leather . . .

LOOK OUT! Rounding the turn into the stretch is the place where horse races can be won or lost. A horse gets "pocketed." A rider is jostled. Because there's *added* danger at the turns, anything can happen! TURNS are crucial danger spots in piping systems, too! That's why welding with Tube-Turn fittings is sounder practice wherever pressure and strain are liable to cause leaks, breaks, or pipe connection failures of any kind. There is a Tube-Turn fitting to protect and strengthen *every* piping turn—all types, sizes and weights—returns, elbows, tees, reducers, laterals, nipples, caps, saddles, and flanges.

Write for helpful engineering data book and catalog.

TUBE-TURNS, Inc., Louisville, Ky. *Branch offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Tulsa, Houston, Los Angeles. *Distributors in all principal cities.*

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Welding Fittings

WHEN THE "PRESSURE'S ON" TUBE-TURN FITTINGS WILL GIVE FULL PROTECTION

In this compact, streamlined assembly, welded pipe lines and Tube-Turn fittings *(indicated by check marks)* will harness wild, live steam in one of America's large industrial plants. A failure at any point here would mean more than stopped production and lost man hours. It could mean terrific damage, perhaps loss of life. But Tube-Turn welding fittings give *added protection* where it's needed—at the turns!

When to Replace Wire Rope

A. J. MORGAN, Chief Engineer, Wire Rope & Strand Division, John A. Roebling's Sons Company, Trenton, N. J.

IMPORTANT THOUGH IT IS, the question of when a wire rope should be replaced is very difficult to answer in general terms. There are no hard-and-fast rules that tell just when to remove rope from all installations. Safe, economical, and practical rope removal practice can be established only by close study of each installation.

Two considerations apply to all installations:

1. Safety
2. Economy

Thus, the question to be answered really is, "How early should a rope be removed for safety's sake; and how late can it be removed for economy?"

Margin of Safety. It is common practice to allow a factor of safety in wire rope installations. This factor of safety is the ratio between the maximum calculated load and the ultimate strength of the rope. These factors of safety vary considerably according to the installation. They are large where rope failure might cause loss of life or serious property damage.

Such safety factors, however, do not afford a really accurate measure of the safety of an installation. The true gage of safety is not the original factor of safety when the rope was new, but rather the amount of usable life left when it is removed.

Economy. Economy demands, that insofar as possible the maximum life of a wire rope be obtained. Good rope practice attempts to establish the greatest length of service commensurate with safety.

Performance Records. Considering each individual rope installation from the standpoint of these considerations and the information given in the preceding data sheets, obviously the safest and most economical practice in removing wire rope can be established only by observation of the effect on the rope of the individual characteristics of a given installation. Therefore careful records should be kept of the performance of the ropes, noting particularly the manner and rate of deterioration. As the ropes are removed, they should be submitted to the rope manufacturer for examination and determination of the remaining strength by an ultimate strength test. The recorded data on the manner and rapidity of deterioration, together with the actual test results, will allow subsequent ropes to be judged much more accurately by surface inspection. After several such typical ropes are tested, sufficient data should be available to form a sound basis for judgment as to time of removal.

Estimating Remaining Strength. The procedure outlined above is the only practical way in which accurate and thoroughly reliable data can be collected on proper removal practice. Guides may be established, however, by which remaining strength can be approximated since this will be governed by the extent to which it has been affected by a combination of broken wires, fatigue, abrasion, corrosion, unbalance, and abuse.

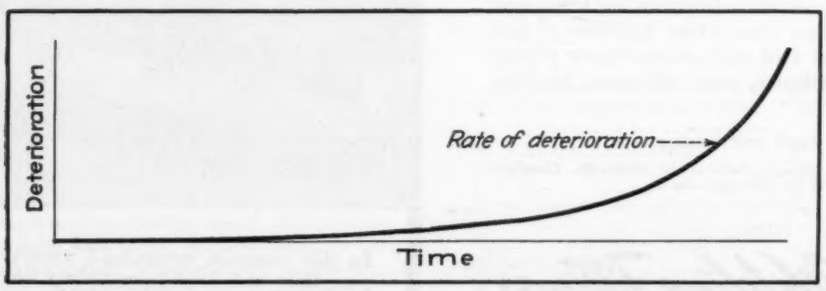
Assume that for a certain installation of 6x37-construction rope, the safety and the operating departments have set a safety practice requiring that the rope be removed when 70 percent of its original strength remains. If broken wires were the only factor to be considered, 50 broken wires in one rope lay could be allowed. If however, abrasion has worn away 25 percent of the cross-sectional area of the outside wires, only 42 broken wires per rope lay would reduce the strength to 80 percent. If abrasion has worn one-third the way through the outside wires, only 26 breaks per rope lay are permissible. Suppose abrasion is increased to 40 percent; then only 10 broken wires will reduce the strength of the rope to 80 percent.

It is readily seen that the effects of one deteriorating factor are greatly augmented by those of another.

This hypothetical case assumes the use of a rope of 6x37 construction in which there are 18 outside wires per strand, and the figures given indicate the rope's condition only when there are no deteriorating factors other than broken wires and abrasion. Every installation therefore must be considered as an individual unit in judging the amount of deterioration that it is safe to allow.

Rate of Deterioration. Even under ideal conditions of operation, the wire rope ultimately will reach the end of its service because abrasion and broken wires will eventually develop. After a certain length of service deterioration of a rope increases rapidly, as the illustration shows. Therefore it is not safe to assume that because 5 percent strength was lost each month during the first three months of service, the same rate will continue. The point at which the rate line swings acutely upward may be reached any time during the operation of the rope.

Corrosion. Where corrosion is a factor there is no safe guide for judging the proper time of removal of the rope. Even ultimate strength tests on corroded ropes can be misleading because they cannot indicate the rapid rate of deterioration that might occur if the rope were continued in service. Corrosion in a wire rope can be controlled by proper and suitable lubrication. When corrosion has started in a rope it can be retarded by lubrication, but the lubricant cannot restore the rope to its original condition; therefore, this rope must be regarded as a corroded rope.



Deterioration of wire rope increases rapidly after a certain period

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PROUD as we are of the Fairbanks-Morse trade-mark, we urge that before buying you look beyond the trade-mark—*look at the motor.* For we know, and you know, that it's the motor and not the trade-mark that runs machines.

And because we believe you know motor quality when you see it, we ask you to look at the construction of an F-M Motor point by point. Compare the exclusive F-M Copperspun Rotor, for instance, with the rotor in any other squirrel cage motor. You'll say, we're sure, that you want windings centrifugally cast of COPPER, rather than of some less suitable metal.

Would you like to look further into the construction advantages that give F-M Motors their proved stamina? A post card or telephone call will bring you a demonstration. Fairbanks, Morse & Co., Dept. E31, 600 S. Michigan Ave., Chicago. Branches and service stations throughout the United States and Canada.

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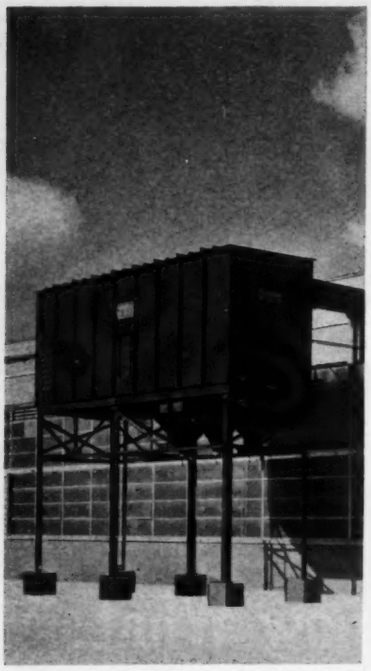

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more about the items mentioned on this page

Letters to the addresses given will bring information

• TRANSMITTING INFORMATION to employees is discussed in a digest of current practice based on methods employed by a number of representative companies. Covers employee handbooks, magazines, newspapers, bulletin boards, union periodicals, etc., 20c. Industrial Relations Section, Princeton University, Princeton, N. J.

CHALLENGE to "keep it up to date" ought to inspire you to fill a pocket-size calendar-bank with $25 worth of nickels, dimes, and quarters. A quarter changes the month dial. Any one of the coins changes the day dial. M. A. Gerett Corp., Milwaukee

• GAS HEATING for industrial buildings. Preliminary report (30 pages) of the Committee on Industrial Space Heating of the American Gas Association, 420 Lexington Ave., New York, analyzes gas heating, market for it, equipment, installation, cost. 25c.

• "SELECTION and Training Procedures in Expanding the Working Force" contains discussions on selection procedures, training workers, development of supervisors. 50c. American Management Association, 330 West 42nd St., New York.

• IF YOU are looking for a way to cut down on time spent on the paperwork necessary to efficient production control, a vivid presentation of forms and a mechanical method of writing them should be of help to you with your problem. Addressograph-Multigraph Corp., 1200 Babbitt Road, Cleveland.

• WOOD FILING CABINETS, to save steel for war production, are available in two types—with roller-bearing cradle suspension, and non-suspension with four rollers to each drawer. Four-drawer style, letter and legal widths. All-Steel-Equip Co., Aurora, Ill.

• METAL-WORKING LATHES, care and operation. Text for training purposes has just been issued in its 41st edition so as to include the latest information available. 128 pages, over 365 illustrations. 25c. South Bend Lathe Works, South Bend, Ind.

• WHY HAVE your engineers and draftsmen spend valuable time hand-lettering dimensions, instructions, and manufacturing data on finished drawings when a variable-type engineering composing machine can do it in a fraction of the time? Changeable font permits variety in styles and sizes of letters. Can accommodate 20-ft. sheets. Ralph C. Coxhead Corp., 333 Sixth Ave., New York.

• READINGS of diameters and circumferences of any circle up to 72 inches diameter in steps of $\frac{1}{8}$ inch or less, and circumferential divisions of 1/16 to $\frac{1}{2}$ inch, are obtainable from a chart on which are laid out eleven concentric circles with dimensions. All readings in fractions of an inch. Interstate Sales Co., 1123 Broadway, New York.

• TO SPEED UP design and specifications work in metal working, a slide rule provides American Standard dimensions for varying sizes of nuts, bolts, plain washers, and like parts, as approved by American Standard Engineering Committee. Lists decimal equivalents of fractions, millimeters into inches, etc. 50c. The Elemoto Sales Co., Teaneck, N. J.

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That's another typical example of how Sun Engineering Service and Sun Industrial Products working as a team are helping industry win its greatest battle of production. Whether it be a metal working problem to be answered . . . a processing formula to be revised . . . or power drag to be reduced, Sun's Doctors of Industry always stand ready . . . willing . . . and able to help you. Their services are yours to use for improving production . . . for proof of what they have accomplished, write for your free copy of "Helping Industry Help America."

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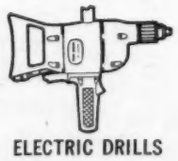
By Selecting VAN DORN Tools

TAKE a tip from the Weber Showcase and Fixture Co., Inc., Los Angeles, California. They found Van Dorn Tools were "just the thing" when they suddenly changed over from making showcases and display counters to manufacturing ship ventilators on priority orders. Because of the nature of their products, they could not use fixed machinery—were forced to "take the tools to the job." Van Dorn Portable Electric Tools were chosen because of their greater efficiency, lower maintenance cost, and the fact that one of Van Dorn's 26 factory-owned service branches was in a position to provide quick service, overhaul and factory parts when needed, without delaying production.

When changing over *your* plant, you too will find just the tools you need to speed production among the more than 100 in the Van Dorn Line. For complete information, write: The Van Dorn Electric Tool Co., 719 Joppa Road, Towson, Maryland.



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PORTABLE ELECTRIC TOOLS

waukee, Wis., is turning out, and where and how these products are helping to produce the weapons of war. Moving picture, same title and theme, depicts America's industrial might.

QUICKLY APPLIED and easily removed, these stickers will adhere without moisture to any smooth surface—polished metal, glass, plastics. Especially useful as inspection, rejection, instruction, and identification labels. Avery Adhesives, 451 East Third St., Los Angeles

• SUBCONTRACTS. How to go after them is explained in a booklet obtainable from the Copper & Brass Research Association, 420 Lexington Ave., New York. Lists regional offices (state, manager, telephone, and address) of the Contract Distribution Branch of WPB.

• PAMPHLET on wage adjustment and grievance policies covers adjustments for payroll flexibility, grievance handling, and a mediator's view on grievance procedure. 75c. American Management Association, 330 West 42nd St., New York.

• STOP AND THINK before you toss away used office supplies, warn wastebasket signs designed by the Studebaker Corp., South Bend, Ind., to impress on employees the importance of not discarding what can be used again.

• "THE YEAR 1941" is the title of a booklet printed by the Caterpillar Tractor Co., Peoria, Ill., to review for employees the events and progress of the company during the year. Covers both war production and employee activities.

• LARGE electric clock, operates on a.c., shows time in numerals timetable fashion, e.g., 12:45, rather than by the conventional hands and dial. Numerals are white on black ground and stand two inches high. Victory design makes it specially suitable for plants, shops, and offices. M. M. Gottlieb Associates, Inc., Allentown, Pa.

• SELECTED REFERENCES on problems and policies in industrial relations in a war economy are listed in a pamphlet (fourth supplement) made available by Industrial Relations Section, Princeton University, Princeton, N. J. 25c.

Have You a DIFFERENT Fluid-Cleaning Problem?

Then you will probably find your answer in this list of Cuno features. And look for other Cuno ads — each one describes four services for which Cuno "Filter-Fine" Strainers have been selected over other fluid-cleaning methods.

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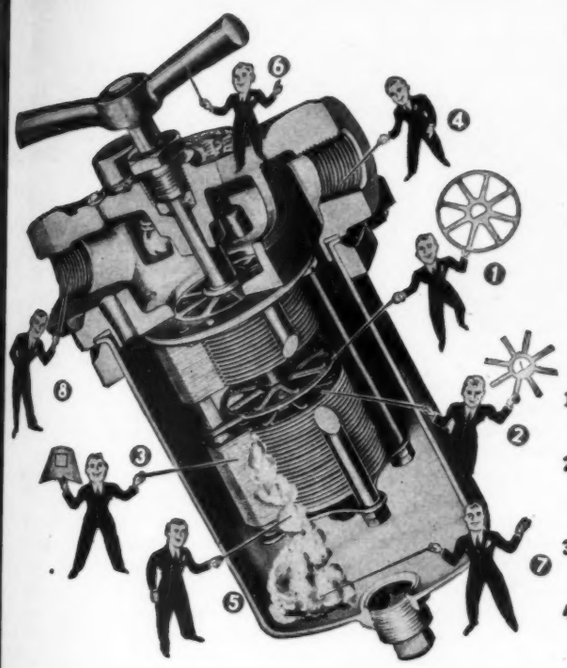
1. Cleanable (manually or automatically) without interrupting fluid flow.
2. Non-collapsible, all-metal construction.
3. Minimum pressure drop.
4. Permanent filter element — no cartridge to replace.
5. Obviates duplex installation.
6. Cleaned by *combing,* not scraping.
7. Minimum filter maintenance.

Made of any machinable metal in a wide range of sizes — small compact units up to massive motor-driven models — to handle fluid, air, gas.



NO STOPS FOR CLEANING FLUID
NO STOPS FOR CLEANING FILTER

1. Wheel-shaped discs are stacked on a central rotatable shaft.
2. Discs are held apart by spacers conforming in shape to discs but without rim.
3. Cleaner blades stacked on stationary rod extend into slots between discs.
4. Fluid containing solids enters casing here . . . must pass between discs.
5. Solids larger than space between discs are retained on outer edges.
6. Turning handle by hand or motor causes discs to rotate past stationary cleaner blades.
7. Rejected solids fall to bottom of sump . . . drained when convenient.
8. Filtered fluid passes out here.

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KEEP FLOW ON "GO" WITH

CUNO

THE "FILTER-FINE" STRAINER

There are many Cuno models . . . this FREE booklet describes them. Send coupon.

CUNO ENGINEERING CORPORATION
605 South Vine Street, Meriden, Conn.

Please send free copy of "Quick Facts" to

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Install

JOHNSON

Leaded Bronze

BEARINGS

How many "lazy" motors in your shop? Before you blame the equipment . . . check up on the bearings. In order to get maximum power from each unit, it is necessary to install bearings that are designed to *assist* the motor . . . not retard it.

Johnson *Leaded Bronze* Bearings enable you to get the most from your motors. A special high lead bronze alloy . . . plus correct design . . . correct tolerances . . . gives you the long life, the smooth operation and the power you have a right to expect.

Johnson Electric Motor Bearings are available from stock for more than 250 individual types of motors. Twenty-two warehouses plus hundreds of distributors are able to give you excellent delivery. A request, on your business letterhead, will bring a copy of our new, completely illustrated catalogue.

JOHNSON BRONZE

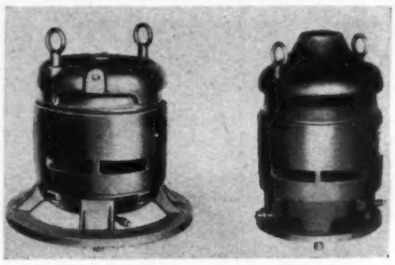
512 SOUTH MILL STREET

NEW CASTLE, PA.

WHAT'S NEW IN EQUIPMENT

Motors

Three motors, vertical general-purpose polyphase, vertical shielded polyphase (1 to 20 hp.), and vertical shielded single-phase (1 to 5 hp.) are announced. The shielded-type motors are especially suited to pumping applications, and the general purpose motor is suitable for use in the machine tool industry as well as for agitators, mixers, and similar applications.



The compact, cast-iron frame and cover of the general-purpose motors are designed to give added protection to electrical parts, without adding materially to the over-all height. Accurate alignment of the motor to the driven unit is assured by machined rabbets on the stator frame and base. Rotating weight and thrust are solidly transmitted to the supporting base through the lower bearing, which is fitted to a one-piece base. Bearings are of the deeply grooved type, and are encased in machined cast-iron housings. All openings are shielded to bar the entrance of chips or other falling objects. Accessibility by grease fittings allows rapid lubrication without disassembly of the motor; the location of eyebolts makes the motor easy to handle; speed measurements are taken by removing the monogram cap from the upper end shield; variety of bases enable this motor to meet many applications.

The polyphase shielded-type motors are available in either solid-shaft or hollow-shaft construction, while the single-phase shielded-type motors are available only in solid-shaft construction. Both shielded types are for normal-thrust or high-thrust applications. The cover is contoured to deflect dripping liquids and falling objects. All openings in the stator frame and end shields are protected against the entrance of splashing liquids. Air is discharged downward at low velocity, thus permitting little or no dust disturbance around the motor. General Electric Co., Schenectady.

Protective Skin Lotion

A special lotion for skin protection under industrial conditions, known as Athea Protective Lanolin and Lotion, is an emulsion of olive oil and lanolin with glycerine and distilled water. Lotion is said to help the skin replace natural oils lost through repeated washings in alkalin soaps, to keep grease and grime from imbedding deeply in the pores and fine wrinkles of the skin, and to contain a mechanical barrier to the chemical irritants in common industrial coolants, cutting, and lubricating oils. Athea Laboratories, 1568 W. Pierce St., Milwaukee.

Coding Control

To provide a method of indicating to employees the danger of air raids and the necessity for blackouts, the Reco motor-driven coding control has been developed. Has two signals, a series of alarms in 15 cycles of raising and lowering tones for two minutes; a steady "all clear" siren blast for two minutes.

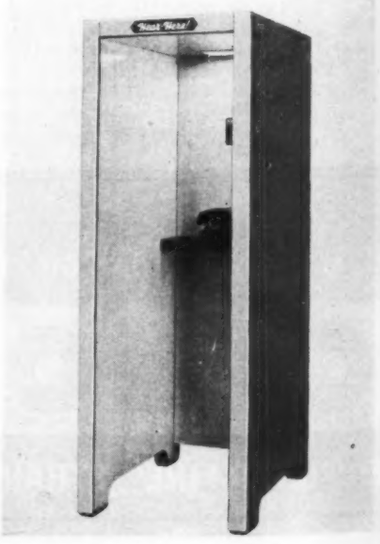
Control is supplied with automatic cutoff and pushbutton start, for 110-volt 60-cycle current. Size 5x6½x4 inches. Can be furnished in weatherproof cabinet with door lock, fuse block, and pushbutton. Reynolds Electric Co., 2650 W. Congress St., Chicago.

Drum Carrier

Lift model carrier for placing and removing 55-gal. drums on and off skids, scales, and platforms has been announced. It moves drums and at the same time raises the containers a full 14 inches off the floor by lowering the handle from the straight horizontal position. Lifting device lifts containers vertically into locked position on the carrier. The operator does not have to touch the container. Ernst Magic Carrier Sales Co., 1456 Jefferson Ave., Buffalo.

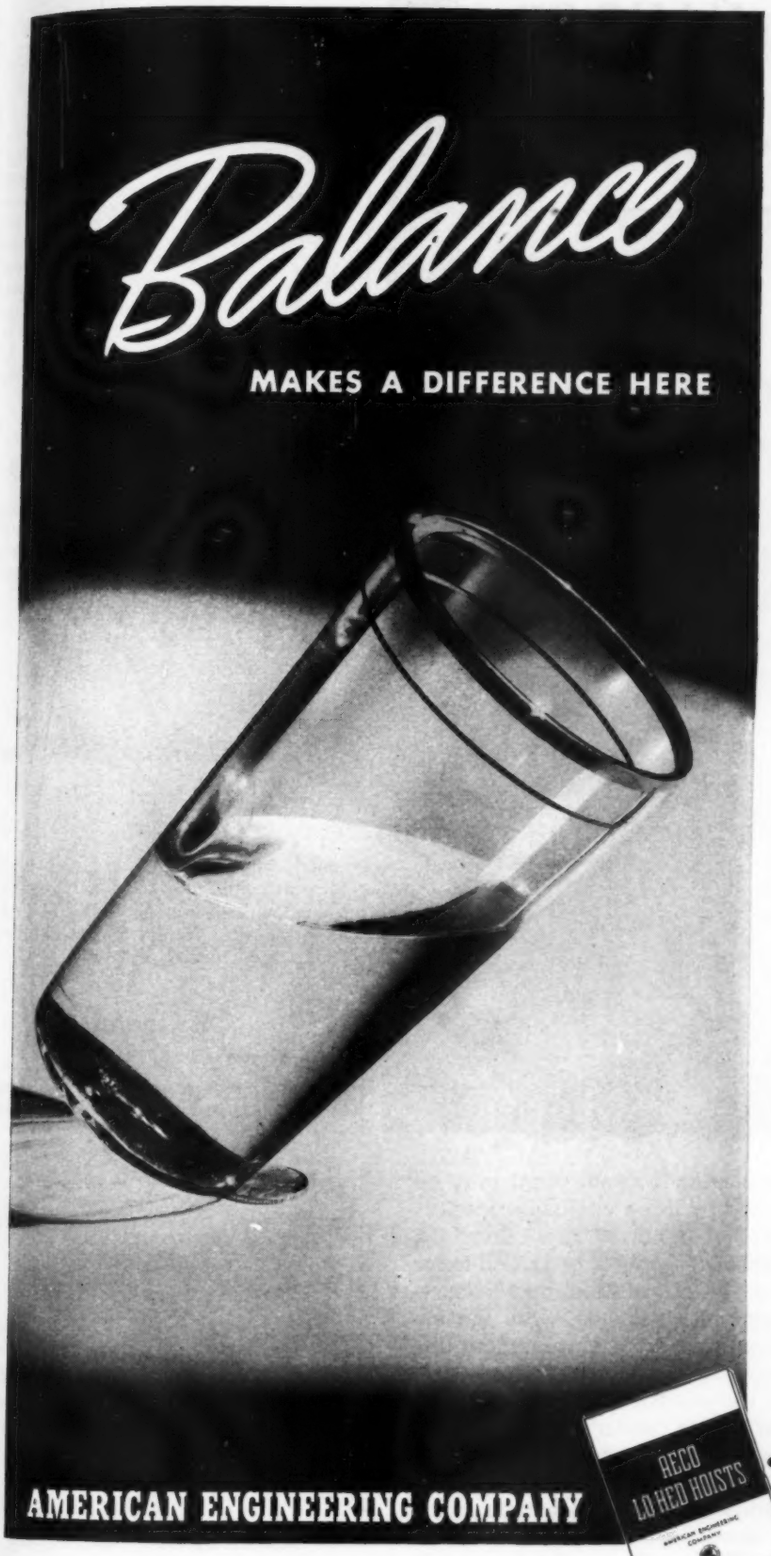
Telephone Booth

To conserve steel Acousti-Booths constructed of heavy reinforced birch plywood specifically designed for industrial



Balance

MAKES A DIFFERENCE HERE



AMERICAN ENGINEERING COMPANY

BALANCE makes a difference in electric hoists

It is a fact that balance makes a startling difference in electric hoist design.

The Lo-Hed hoist is unusual in that its motor and drum are balanced around the beam. Take a look with us and you'll see what this does. It means that the hook can be pulled up close to the beam—a desirable plus feature for which you pay no premium. It means that since motor and drum are parallel they can be connected through a train of efficient spur gears. The drum, motor and gearing are housed by easily removable covers.

Lo-Hed hoists have many other service and safety features, shown in the 28-page Lo-Hed catalog. No point of manufacture is more vital to you today than the precision with which Lo-Heds are built. Although production has been stepped up, Lo-Heds are as painstakingly made now as they were before the war. On past experience that means good service from a Lo-Hed years after we win. So get a Lo-Hed. Send for that illustrated catalog we mentioned today.

The Lo-Hed Hoist Is Applicable To Any Monorail System
There's A Balanced Lo-Hed Electric Hoist For Every Purpose

•

Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative

•

OTHER A-E-CO PRODUCTS: TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

AMERICAN ENGINEERING COMPANY
2426 Aramingo Avenue, Philadelphia, Penna.

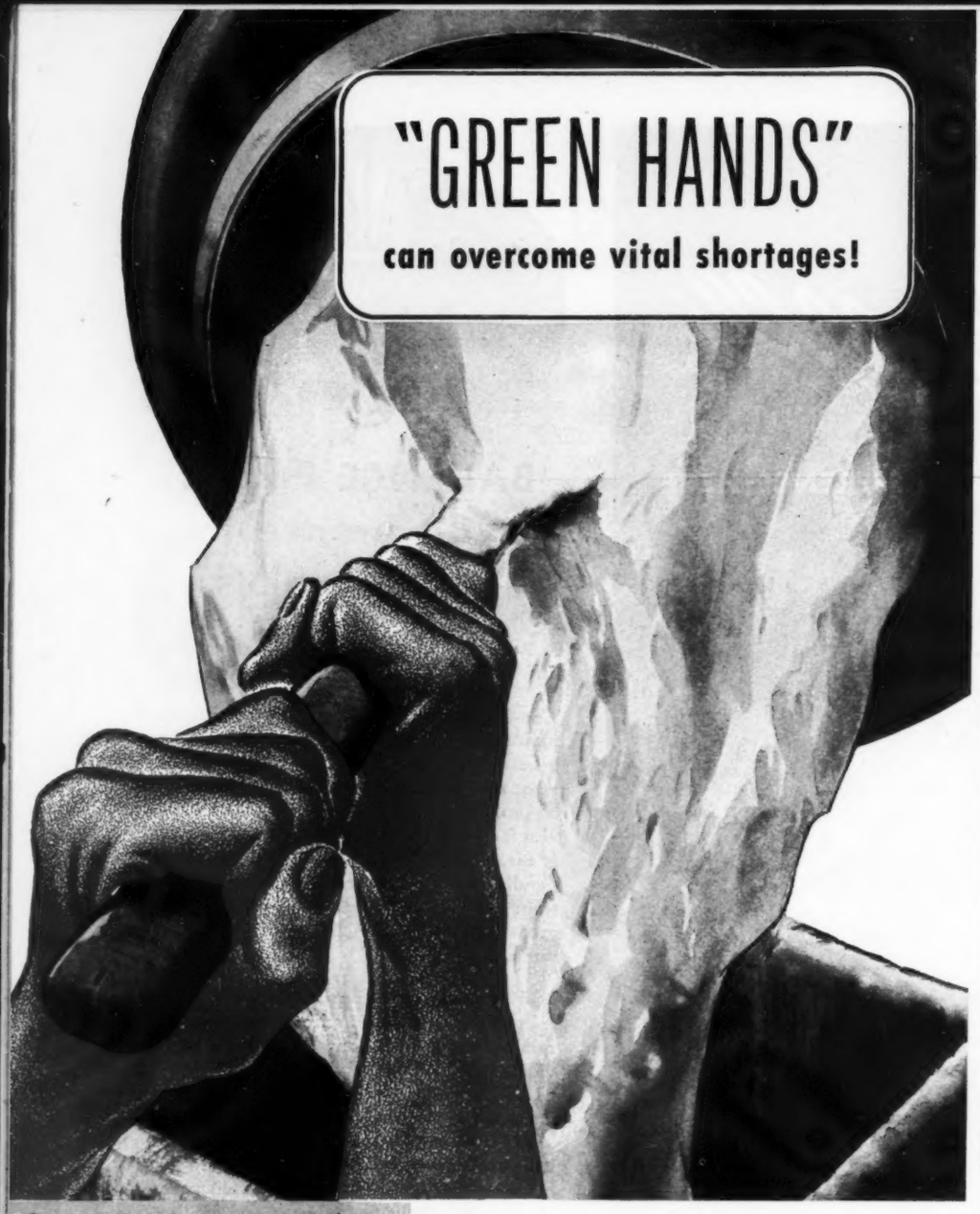
☐ Please send me your complete catalog of LO-HED HOISTS
☐ Ask your representative to get in touch with me promptly

Name _____

Company _____

Street Address _____

City _____ State _____
(Please Print Plainly)



Simple setting of an automatic Foxboro Air Weight Controller steps up foundry output by eliminating scrap and pigging.

Foxboro Verigraph Recorders help operators hold rubber coatings absolutely uniform . . . conserve vital war materials.

ALL-OUT production in your plant may be handicapped by three vital shortages . . . limited supplies of imported raw materials; scarcity of domestic supplies; or skilled-labor shortage. With the aid of Foxboro Measurement and Control Instruments, even the unskilled workmen from your employment line can help to remedy *all three!*

For, all the guesswork is eliminated from production processes, when Foxboro Instruments provide precision automatic guidance and control. "Green hands" need but little training to handle exacting operations accurately . . . "old hands" work with greater speed and assurance. The results are: higher output from present equipment; greater uniformity; absolute minimums of waste and spoilage.

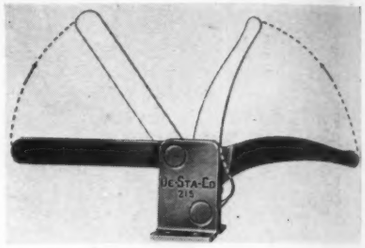
Learn what Foxboro Instruments can do to improve any process in your plant requiring controlled Temperature, Pressure, Flow or Level. Write for information. **The Foxboro Company, 24 Neponset Avenue, Foxboro, Massachusetts, U. S. A.**

FOXBORO
Reg. U. S. Pat. Off.
MEASUREMENT AND CONTROL SYSTEMS

use have been developed. This booth is available without priorities to all users, because no critical materials are used in its construction. Walls and ceiling consist of perforated, reinforced panels, filled with a thick blanket of sound-absorbent material. Known as Model 207, booth is finished in gray, or can be supplied unfinished. A shelf is provided for the telephone, and for taking notes. Overhead electric light fixture with pull-chain provides illumination. Outside dimensions are 30 inches wide, by 79½ inches high, by 38 inches deep. Shipping weight is 225 lb. Burgess Battery Co., Acoustic Div., 530 W. Huron St., Chicago.

Light-Duty Toggle Clamp

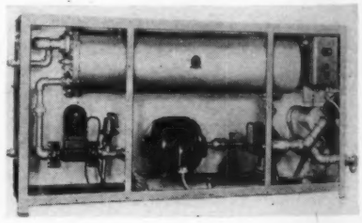
Light-duty, horizontal style toggle clamp Model No. 215, has a pressure ratio of 50 to 1. When in "shut" position both handle and clamping bar are in a hori-



zontal position, thus reducing height. Measurements are 8 11/16 in. across, 2 3/16 in. high over-all, and 1⅜ by 2 1/16 in. at the base. Weight 8½ ounces. Detroit Stamping Company, Detroit.

Oil Coolers

Rapid oil coolers are used to maintain a constant temperature in the oil quench bath for use in heat-treating metals. Self-



contained oil cooler combines all necessary equipment, except the quench tank, in a single package. Available in every capacity requirement. Bell & Gossett Co., Morton Grove, Ill.

Commutator Cleaning Stone

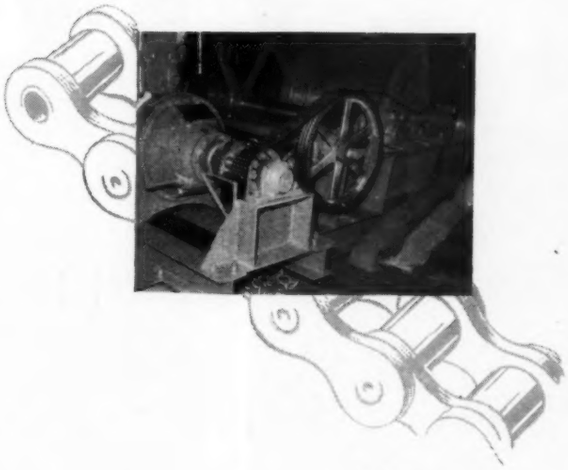
Excess film and dirt caused by heavy, continuous power loads can be removed from commutators with a recently announced cleaning stone, it is claimed.

Cleans while the motor or generator is running. Used by holding stone against the commutator and slowly moving across the face. Does not clog, or cut the commutator. Also cleans film from the brush seats and helps to re-seat brushes.

It is claimed that regular use of clean-

HOW to get more from your machines QUICKLY!

You can, and easily, merely by eliminating these three power transmission "bugaboos":



A *Slippage*—a slipping drive never allows peak machine production.

B *Repairs*—machines shut down for drive repairs are dead weights on any production schedule.

C *Power loss*—you deserve as near as possible 100% return on your power investment.

Why use BALDWIN Roller Chain Belts?

PLEASE NOTE

Although our men and our plants are on an "all out for victory" basis these days, your inquiry will receive prompt attention. Naturally, delivery of B-D products is dependent upon the Priority of your needs.

★

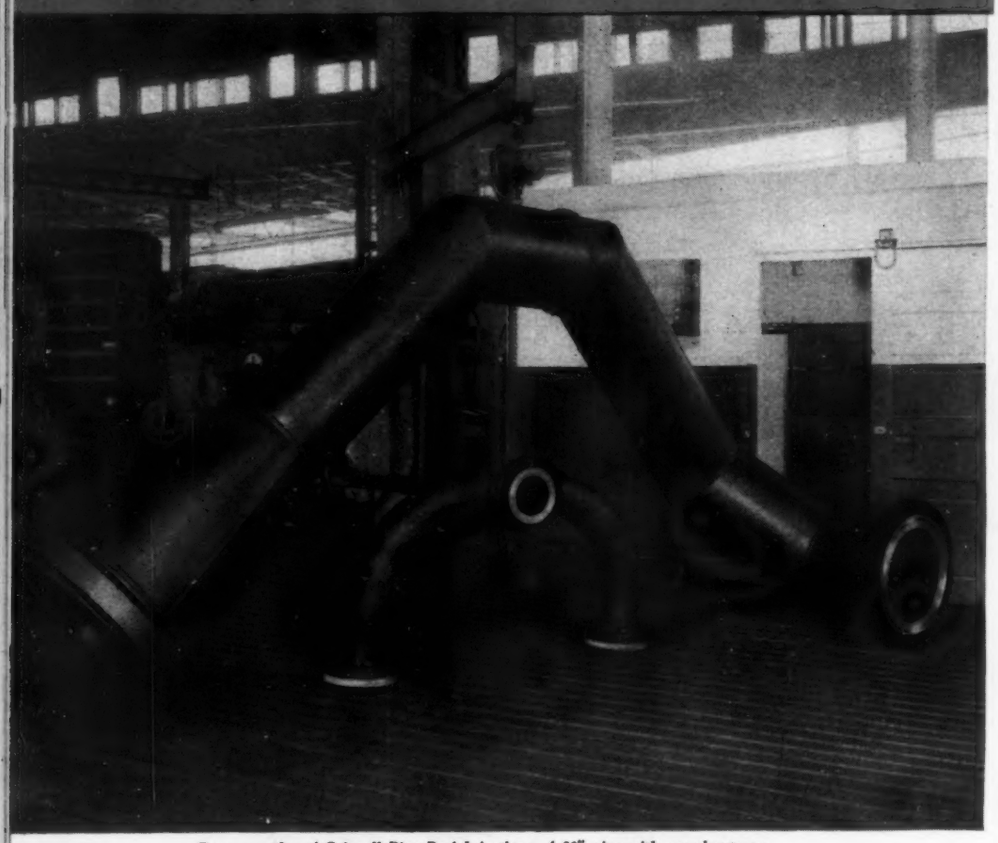
● Baldwin roller chain belts are 98.6% efficient on long or short centers. They eliminate slippage; they last longer, they run quietly.

By replacing with Baldwin roller chain belts—a few gear drives here, a few belt drives there—on conveyors, machine drives, timing on all production machinery—you'll gain an immediately noticeable improvement in production.

For further explanation of these advantages, call the Baldwin man. Baldwin-Duckworth Division, Chain Belt Company, 327 Plainfield Street, Springfield, Mass.

POSITIVE! THAT'S BALDWIN ROLLER CHAIN BELTS

SHORT-CUT TO "ENOUGH . . . IN TIME!"



Two examples of Grinnell Pipe Prefabrication: A 20" pipe with complex turns and 20" x 32" increaser for handling hot oil in one of the new Houdry Process oil refineries . . . and an engine header involving 24"-radius U-bend.

Sub-contract your piping worries!

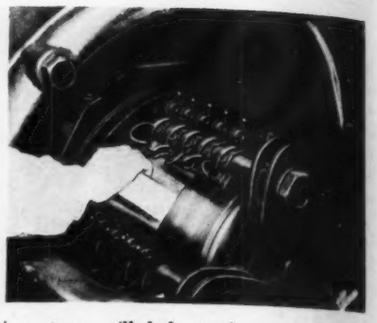
Here's a practical "way out" for power and process engineers who are overloaded with the added work of wartime plant extensions! A way to delegate an exacting job, yet *know* you'll get first class results!

"Give the Plans to Grinnell" as soon as your special piping requirements are roughed out. Grinnell engineers are specialists equipped by long experience to interpret power and processing layouts into super-piping systems for any industry. Grinnell plants, strategically located to serve all industries, have complete prefabrication facilities to produce underwriter-approved sub-assemblies that permit speedy erection.

Learn how such sub-contracting can ease your job of providing facilities to produce "enough . . . in time"! Write for booklet "Grinnell Piping Prefabrication". Grinnell Company, Inc., Executive Offices, Providence, R. I. Branch offices in principal cities of U. S. and Canada.

PREFABRICATED PIPING BY **GRINNELL**

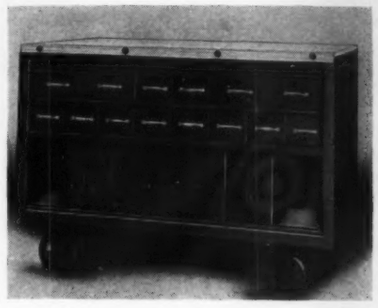
WHENEVER **PIPING** IS INVOLVED



ing stone will help to keep motors and generators on the job 24 hours a day. Im-p ove brush performance, reduce noise, even distribution of brush contact drop and brush wear, and reduce chattering and sparking. Ideal Commutator Dresser Co., 1416 Park Ave., Sycamore, Ill.

Utility Truck

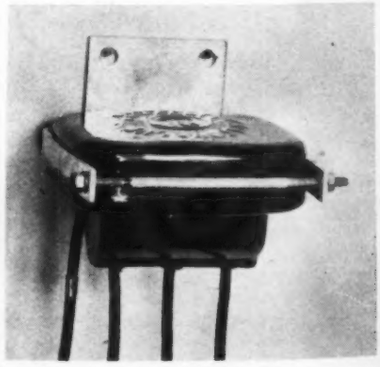
Built to serve as a repair truck, can also be used as a portable worktable or parts truck. Construction is of steel, except the top, which is made up of 1¾x1¾-in. maple planking, glued and bolted together. One side of the truck consists of twelve drawers, plus two roomy compartments.

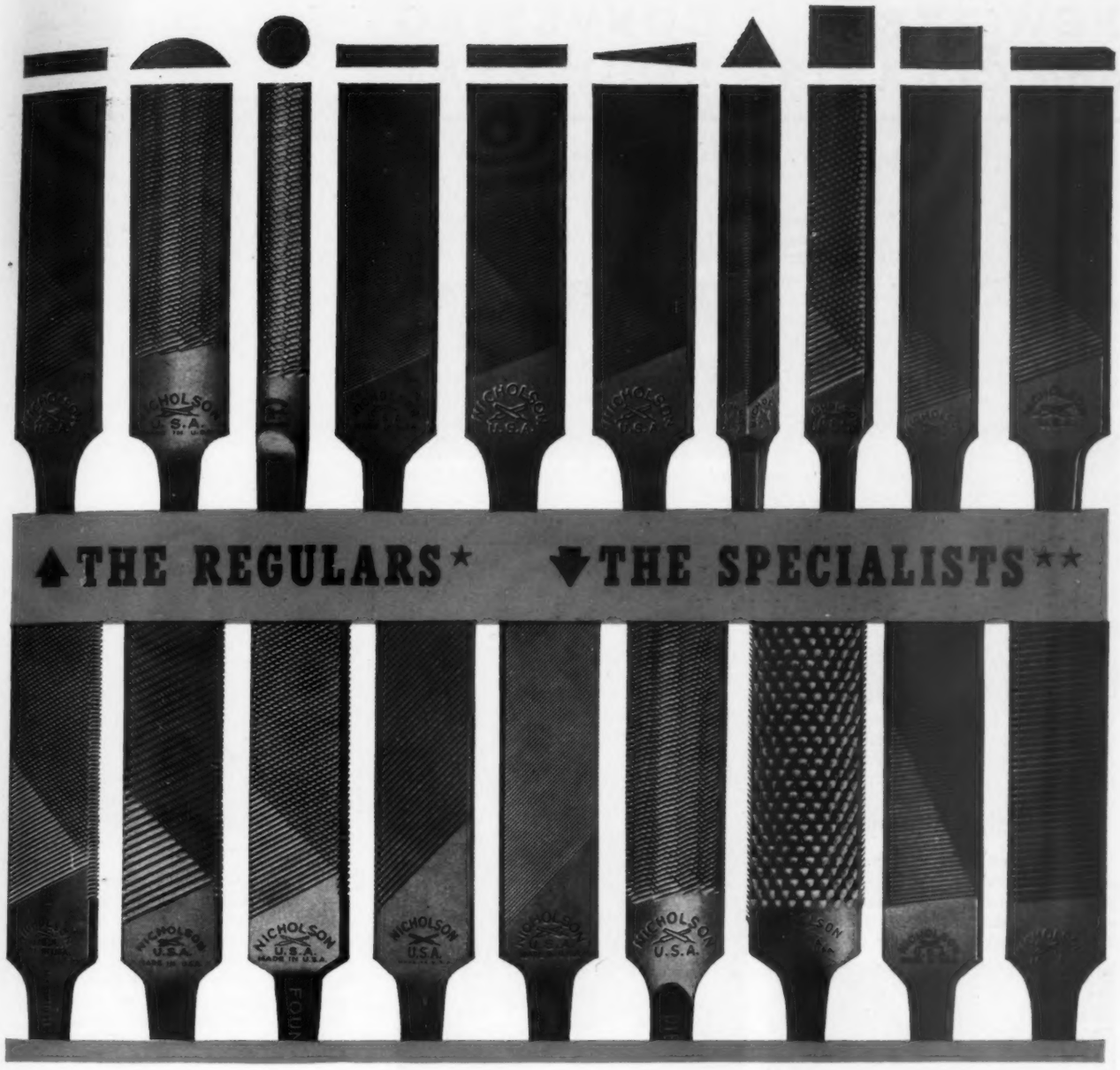


A panel pulls out and down over the drawers. Locked, it offers protection against theft. The other side is one large compartment divided by a shelf. Sliding doors inclose material. Length 60, height from floor top top, 42½, width, 30 inches. The Service Caster & Truck Co., 505 N. Brownswood Ave., Albion, Mich.

Outdoor Protector

To safeguard watthour meters and secondaries of transformers against lightning, a outdoor protector is announced. With a cutoff line to ground rating of 500 volts r.m.s., the unit is for application on 3-





You can command what is probably the most complete army of files in the world when you make Nicholson or Black Diamond brands your standard.

Thus, production lines keep moving, and maintenance and repair work steps along, when your men can always lay their hands on *The right file for the job.*

And when there are special filing problems to be mastered, Nicholson is always a source of help to which you can turn.

Toward meeting heavy war-industry demands, the above are some of the most needed file types under maximum production in the Nicholson factories:

***REGULAR PURPOSE** (*left to right*)—Flat, Half Round, Round, Mill, Warding, Knife, Three-Square, Square, Pillar, Hand.

****SPECIAL PURPOSE** (*left to right*)—For Stainless Steel, Aluminum "A," Foundry, Shear Tooth, Long Angle Lathe, Die Cast, Aluminum Rasp, Brass and Lead Float.

To win the war, we're co-operating with industry—with all we've got! For your file needs, consult your mill-supply house. The Nicholson guarantee: *Twelve perfect files in every dozen.*

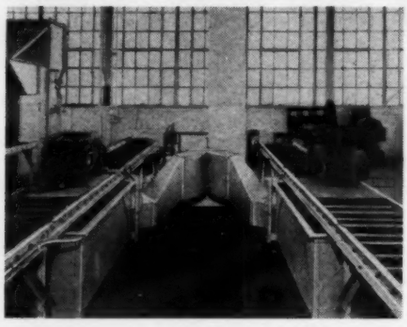
NICHOLSON FILE CO., PROVIDENCE, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON FILES
FOR EVERY PURPOSE

NEW TYPES of CONVEYING and CLEANING EQUIPMENT

"Twin" Installation

To remove sand from castings and clean them thoroughly, Alvey-Ferguson developed this "twin" line installation of special A-F Gravity Conveyors to handle pallets carrying castings through the painting operation. Beneath the conveyor lines there is an air-conditioning system which draws sand particles from the castings before painting. This not only solves the problem of cleaning the castings quickly but gives an added protection to



the workmen by keeping the atmosphere clear of dust and sand particles. The Alvey-Ferguson Co., 125 Disney St., Cincinnati, O.

Chain Conveyor

In many installations where level conveyors are used for carrying tote boxes or cases, Alvey-Ferguson Chain Conveyors are applied because they are endless—the entire length of the conveyor is used as a

carrier. Chain Conveyors of this type are also used instead of belt conveyors when deflections are required on and off the conveyors. The Alvey-Ferguson Co., 125 Disney St., Cincinnati, O.

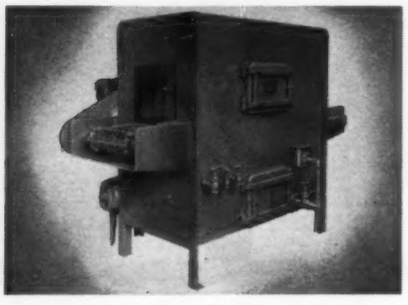
Trolley Conveyors

Supported entirely from overhead, this A-F Trolley Conveyor allows for aisleways and releases large areas of floor space for production machinery and other manufacturing operations or storage. By keeping a bank of material constantly on this A-F Trolley Conveyor, additional storage space is also secured. Furnished with various types of attachments including clevises, swivel hooks, rings or single bolted

attachments to which can be attached special carriers to carry parts through various operations and processings such as cleaning, dipping and paint drying. The Alvey-Ferguson Co., 125 Disney St., Cincinnati, O.

For Cleaning Various Sizes and Shapes

An inexpensive, small, compact A-F unit for thoroughly cleaning metal parts of various sizes and shapes on all four sides. The fan-shaped nozzles have a high coefficient of turbulence and powerful stripping action. To remove oil film, a com-



bination skim box, drain and overflow empties into drain line and is controlled by a valve. Comes with wire mesh conveyor, with flight bar conveyor optional. This A-F washing machine can be placed directly into conveyorized production line. The Alvey-Ferguson Co., 125 Disney St., Cincinnati, O.

To solve your material movement, product movement or product cleaning problems write, wire or phone, without obligation on your part, for a discussion with an A-F Conveyor Engineer. Or write for catalogs—today. The Alvey-Ferguson Co., 125 Disney St., Cincinnati, O.

CONVEYING A-F MACHINERY

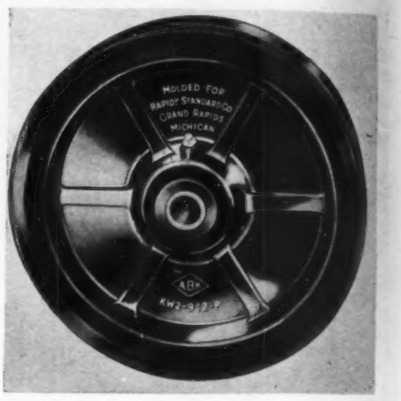
ALVEY-FERGUSON *Conveyors*

AND PRODUCT WASHING MACHINES

phase circuits of from 110 to 575 volts. Discharge capacity is 20,000 amperes crest, and gap breakdown on impulse is 2500 volts average. Inclosed in a wet-process porcelain casing to obtain moistureproof construction, unit is made up of porous block Autovalve elements. When installing, the protector ground load is grounded to the meter case or conduit, equalizing the meter coil and protector potentials. This eliminates the possibility of a flashover from the meter case to the potential coils in meters which are insulated in accordance with modern practice. Westinghouse Elec. & Mfg. Co., E. Pittsburgh.

Resinoid Wheels

It is claimed that ABK resinoid wheels will not strike sparks, can't be overloaded, stand impact, and that oils, greases, organic acids, dilute mineral acids, and temperature changes do not affect them. Push easily under capacity loads.



Composed of two component parts that are molded under high heat and pressure into one indestructible unit. Core stock is compounded for resiliency and shock-absorbing qualities to make the wheel highly resistant to impact. Laminated tread stock is resistant to wear and impact, and chipping is reduced to the minimum.

Available in a number of sizes for industrial truck and caster uses. The Rapids-Standard Co., 535 Bond Ave., N.W., Grand Rapids, Mich.

Steel Workbench

Heavy-duty workbenches are given a more diversified use by addition of several accessories. The basic steel bench may be equipped with single drawer, two- or three-shift drawer units, for multiple-shift operations, half-depth shelf, full-depth shelf, back and end stops, footrest, or full-length bench riser. Shelves and stringer are made in one piece for added strength and rigidity. Lyon Metal Products, Inc., Clark St., Aurora, Ill.

Fluorescent Lamps

Two sizes recently added to fluorescent lamp line, 6-watt and 8-watt lamps, are designed for supplementary lighting purposes, instrument panels, and over machinery. The 6-watt lamp is 9 inches long, the 8-watt lamp is 12 inches long. Both are T-5's or $\frac{5}{8}$ of an inch in diameter. Single

Time is the most critical material!

TIME CAN'T BE BOUGHT BUT IT CAN BE SAVED

Surging through thousands of shops and plants there's an unbeatable determination to win Victory, and win it in shortest possible time. • TIME!—that's the vital element. Even fractions of minutes are precious. Seconds lost by one machine, multiplied by many machines, result in wasted days and weeks—even months. Such time waste is a dangerous enemy at our door. • Consider procedures in production and you'll find that operations revolve around *paper work routines.* In effect, they help to control production, and this control can either *SAVE* time or *WASTE* time. • To *simplify* and *organize* paper work routines . . . to *decrease* non-productive time, *prevent* costly mistakes and *diminish* expensive wastes . . . to *facilitate* accuracy in determining costs . . . these are the functions of Addressograph-Multigraph methods.

USERS OF OUR PRODUCTS are entitled to the services of our Methods Department. It can help to extend the use of their equipment in Purchasing, Storeskeeping, Production, Marketing, Shipping, Billing, Collecting, Disbursing and all key operations of business. To those who are interested in up-to-date information on better methods it is available on request, without charge.

ADDRESSOGRAPH-MULTIGRAPH CORPORATION • *Cleveland* • *Ohio*

(A poster enlargement of above, free of advertising and suitable for bulletin board or framing, will be sent free on request.)

Addressograph-Multigraph Methods SAVE BRAIN HOURS AND MAN HOURS

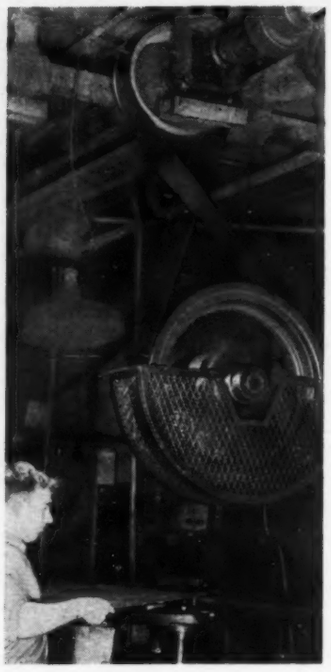
Get More Output from Your Machines

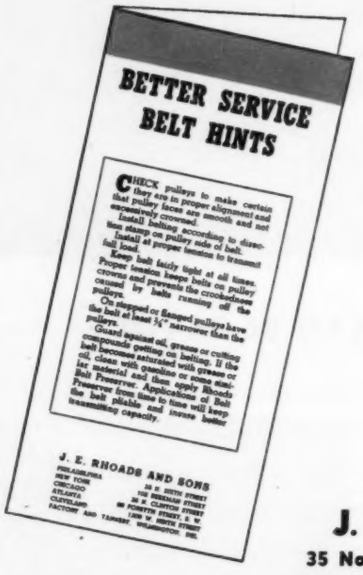
Bypass the bottleneck on new machines!

Keep present equipment operating at top efficiency and insure the best performance from new or revamped machines with Tannate flat leather belting.

Years of dependable service are built into every Tannate belt. Unusual strength (approximately 30% to 50% stronger than most choice oak belting) and firm pulley grip keep machines running smoothly at full capacity even under varying load conditions. High temperatures (170° F. wet and 212° F. wet) moisture, machine oil and many weak chemicals have little effect on Tannate. And Tannate will stay on the job 24 hours a day, seven days a week with little maintenance and infrequent shut downs.

Let Tannate speak for itself with increased output, longer service-life, reduced costs. Why not give it a trial in your plant?





←FREE HELP

Our new folder "Better Service Belt Hints" tells how to keep belts on the job with A-1 efficiency. Put a copy in the hands of every one of your men concerned with belting. No obligation.

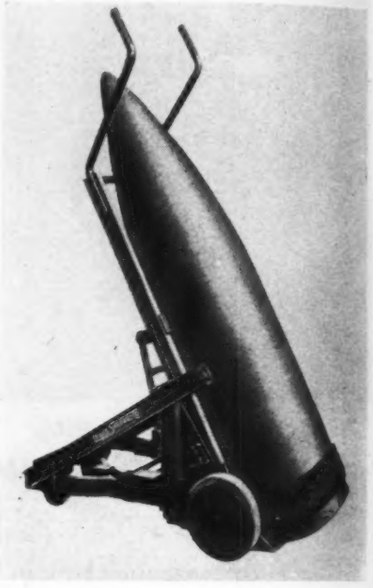
J. E. RHOADS & SONS
35 North 6th Street Philadelphia, Pa.
NEW YORK • CHICAGO • ATLANTA • CLEVELAND

STEP UP PRODUCTION with
RHOADS
Tannate
WATERSHED LEATHER BELTING
Established 1702

lamp ballasts have been used exclusively with these lamps and the circuit for connecting them on 110–125 volt a.c. lines is the same as the standard single-lamp circuit. For efficient installation and operation, each requires a specially designed ballast, starter, and lampholder. In two colors, 3500-deg. white and daylight. Both lamps have an average rated life of 750 hours. Hygrade Sylvania Corp., 500 Fifth Ave., New York.

Shell Truck

Designed to handle shells 72 inches in length, having a diameter of 16 inches and weighing 2800 pounds, load pivots around a point near truck's center of gravity, keeping the load in balance so that one man can raise or lower it. Equipped with a hydraulic release check that further cushions the movement of the load.



It has easy rolling, rubber-tired wheels on antifriction bearings. In transporting the shell, carriage of truck is lowered to a horizontal position by the operator. When ready to unload the truck, operator again can easily raise the carriage and shell to the vertical position. Truck can be made to handle other cylindrical products. Lewis-Shepard Sales Corp., 245 Walnut St., Watertown, Mass.

Current Limiting Potential Transformer Fuse

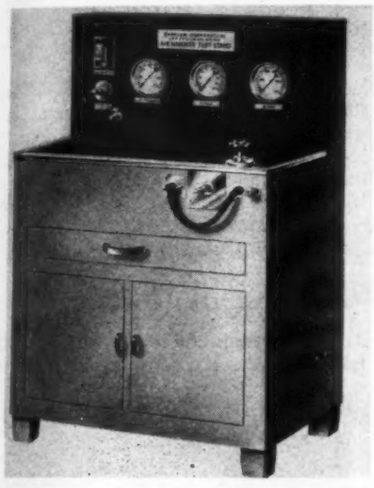
For protection of potential transformers on high power lines and industrial plant circuits, a current limiting fuse using boric acid, known as type BAL combines the functions of a current limiting resistor and fuse in a compact unit suitable for application on a system of high short-circuit capacity. Can safely be applied on the largest powerhouse bus as well as on the metering transformer at the smallest substation. Interrupting ratings are from 80,000 amps. at 2300 volts to 65,000 amperes at 22,000 volts.

Operation is in either of two ways, depending on the magnitude of the fault current. On low fault currents the boric acid

in the main fuse element melts. Since this is spring-operated, the current is interrupted at once without melting the auxiliary fuse wire. On fault currents of short-circuit magnitude the current flows through both main and auxiliary fuse elements with practically no limiting effects until the auxiliary fuse element melts. Westinghouse Elec. & Mfg. Co., E. Pittsburgh.

Air-Hammer Test Bench

To determine the operating efficiency of air-driven hammers, or to check the performance against predetermined standards, Burklyn test stand shows the three basic factors of performance—air consumption, force exerted by hammer, and blows per minute. Test stand measures 40 inches in width, 24 inches in depth at the work-table level, and is 58 inches high. Work table extends across the full width of the stand and is 18 inches deep, providing ample room to perform repairs and adjustments on the hammers. Average air pressure is the only external connection to the

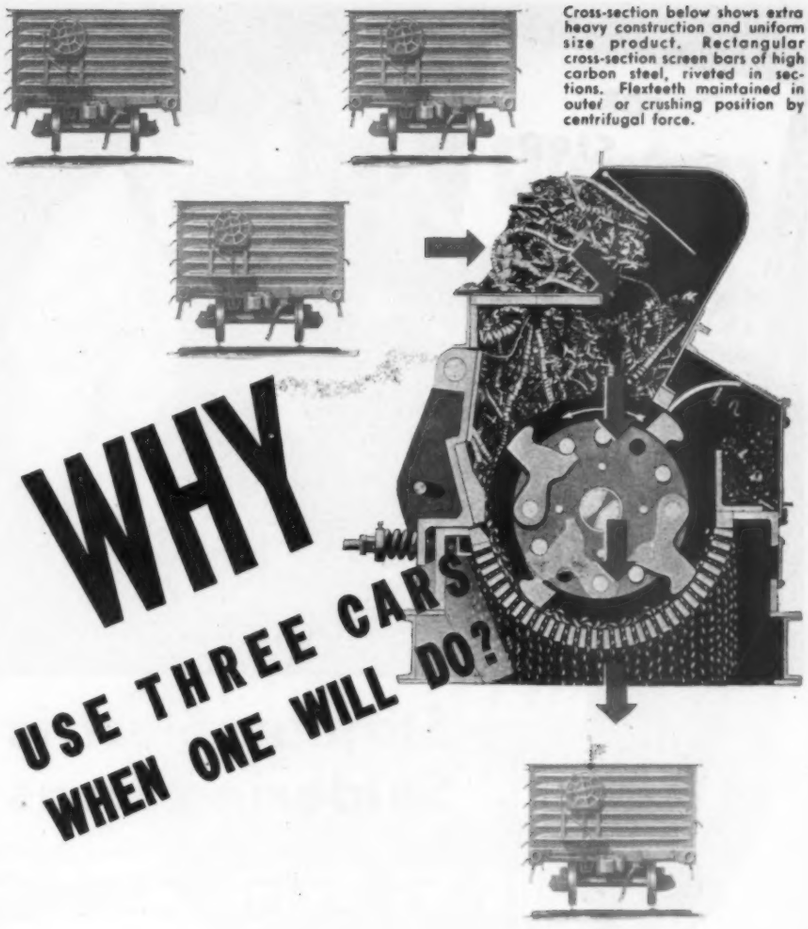


test stand. Regulator on the instrument panel is provided so that a uniform testing pressure can be maintained. After the air is regulated it goes through an accurate flowmeter that indicates, in cubic feet per minute, the volume of air consumed by the tool being tested. At the same time the force exerted by the tool and the number of blows per minute are shown on two separate gages. The force gage is calibrated to 200 pounds, and the blows-per-minute gage 0–5000 blows per minute.

Test stand is designed primarily for aircraft types of rivet hammers, capable of driving aluminum rivets up to 7/16-in. diameter, and soft iron or dual rivets up to ½-in. diameter, requiring a maximum of 40 cubic feet per minute. For larger hammers, flowmeters and force gage of greater capacities may be provided and adapters used for the larger sized rivet sets. Burklyn Corp., 3427 Glendale Blvd., Los Angeles, Calif.

Electric Etchers

Electric etchers made in various models, are adapted for marking dies, tools, and other portable equipment for permanent identification of all smooth-surfaced steel,


Cross-section below shows extra heavy construction and uniform size product. Rectangular cross-section screen bars of high carbon steel, riveted in sections. Flexteeth maintained in outer or crushing position by centrifugal force.
WHY
USE THREE CARS
WHEN ONE WILL DO?

Railroad cars needed for war material!

Question: What can *you* do about it?

Answer: REDUCE your metal turnings . . . then load *one* car of crushed instead of *three* cars uncrushed.

Formula: Jeffrey patented metal turnings crushers *will* give you a uniform product . . . *will* convert long, tangled masses of steel and brass turnings into short or shoveling lengths.

Advantages: Uniform size chips • Better market price • More easily handled — conveyor or magnet • Less storage space • More tonnage per car • De-oiled more easily.

THE JEFFREY MFG. CO.
911-99 North Fourth St., Columbus, Ohio

Stanley Electric Soldering Irons

Use them 'round the clock! Keep them going on your toughest soldering jobs! Stanley Electric Soldering Irons maintain a steady heat. Their quality and built-in features keep them going on production long after ordinary irons are "out" for repairs. Made in both Screw Tip and Plug Tip styles.

Your distributor can supply you. Write for the helpful booklet, "Expert Soldering".

A COMPLETE LINE OF TOOLS UNDER EACH INDEX LISTING

Write for a copy of the Stanley Industrial Tool Catalog No. 50. It's the top reference book for fine hand tools.

STANLEY
Trade Mark

Get the details on Stanley Armor Clad Tips. Special Metal Sheath gives them greater productivity – long, trouble-free life.

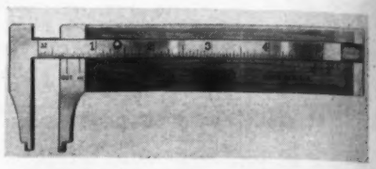
STANLEY TOOLS
DIVISION OF THE STANLEY WORKS
151 Elm Street, New Britain, Connecticut
THE TOOL BOX OF THE WORLD

iron, and their alloys. Eetcher includes tools, switch, indicator lamp, cords, in a compact, portable case.

Made for both light and heavy etching. Lighter type of etching is on tools, gear, saws. The heavy-duty etching is on large-sized, smooth-surfaced objects, including shovels, crowbars, castings. Red light tells operator when switch is open. Etcher plugs into socket of corresponding current. Switch is turned to desired etching heat. Model A weighs 16 lb., Model B, 29 lb. Breuer Electric Mfg. Co., 5100 N. Ravenswood Ave., Chicago.

Pocket Caliper Rule

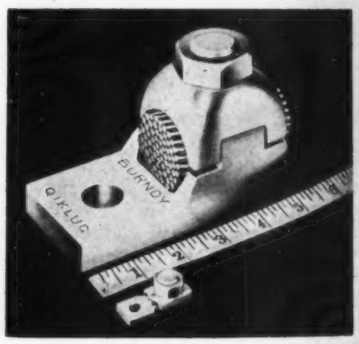
Pocket-size caliper rule No. 136½ can be used for accurate inside and outside measuring of rods, tubing, squares, cable, rope, bolts, pipe. Caliper capacity permits measuring hole diameters from 7/32 to 5 inches, and widths or lengths up to 5



inches. Diameter of rounds up to 3 inches also can be measured. Rule is made of boxwood, with brass caliper slide graduated by 16ths and 32nds its full length of 5 inches. Back of rule has vertical graduations in 16ths for easy measuring up or down, right or left on straight surfaces. Stanley Tools, New Britain, Conn.

Terminal Connector

Terminal connector Quiklug QA(-)B takes a wide range of conductor sizes, is

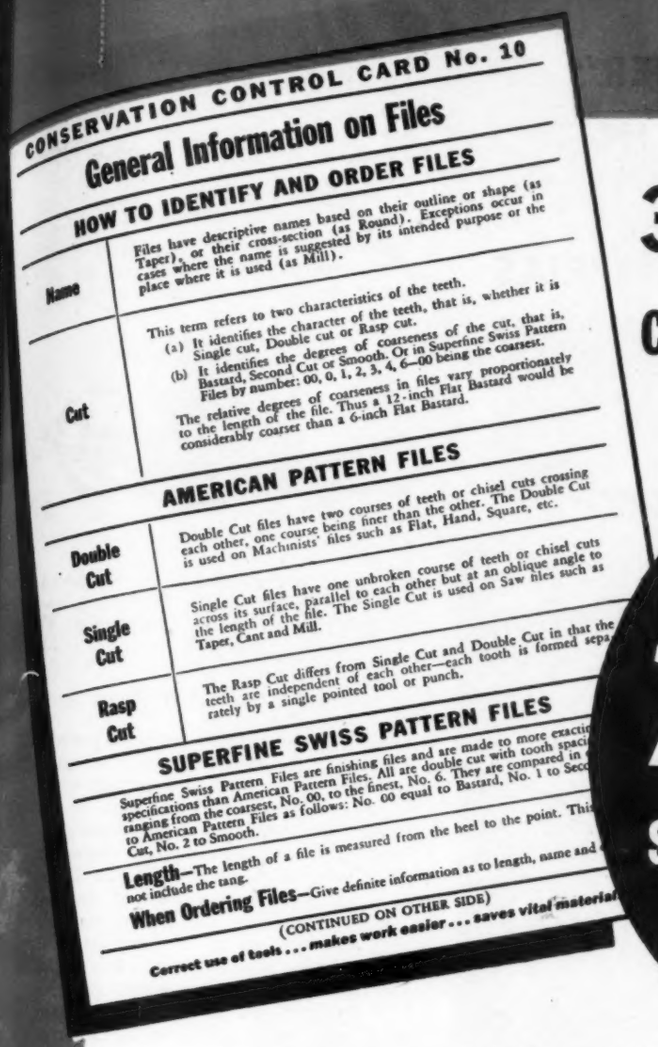


compact, and is provided with serrations on cable clamping elements on all but the small sizes. Burndy Engineering Co., Inc., 459 E. 133rd St., New York.

Safety Transformer

Safety transformer which provides for two 32-volt a.c. extension lines to give light for the workmen who must perform their duties under conditions in which explosive gases or vapors exist, or where inflammable materials are stored or in process, and where the possibility of a high voltage spark may cause damage.

Unit is also adapted for inspection work where workmen must come in contact with moist surfaces or conditions. A compact portable instrument that may be



CONSERVATION CONTROL CARD No. 10

General Information on Files

HOW TO IDENTIFY AND ORDER FILES

Name — Files have descriptive names based on their outline or shape (as Taper), or their cross-section (as Round). Exceptions occur in cases where the name is suggested by its intended purpose or the place where it is used (as Mill).

Cut — This term refers to two characteristics of the teeth.
(a) It identifies the character of the teeth, that is, whether it is Single cut, Double cut or Rasp cut.
(b) It identifies the degrees of coarseness of the cut, that is, Bastard, Second Cut or Smooth. Or in Superfine Swiss Pattern Files by number: 00, 0, 1, 2, 3, 4, 6—00 being the coarsest.
The relative degrees of coarseness in files vary proportionately to the length of the file. Thus a 12-inch Flat Bastard would be considerably coarser than a 6-inch Flat Bastard.

AMERICAN PATTERN FILES

Double Cut — Double Cut files have two courses of teeth or chisel cuts crossing each other, one course being finer than the other. The Double Cut is used on Machinists' files such as Flat, Hand, Square, etc.

Single Cut — Single Cut files have one unbroken course of teeth or chisel cuts across its surface, parallel to each other but at an oblique angle to the length of the file. The Single Cut is used on Saw files such as Taper, Cant and Mill.

Rasp Cut — The Rasp Cut differs from Single Cut and Double Cut in that the teeth are independent of each other—each tooth is formed sepa... rately by a single pointed tool or punch.

SUPERFINE SWISS PATTERN FILES

Superfine Swiss Pattern Files are finishing files and are made to more exacti... specifications than American Pattern Files. All are double cut with tooth spaci... ranging from the coarsest, No. 00, to the finest, No. 6. They are compared in ... to American Pattern Files as follows: No. 00 equal to Bastard, No. 1 to Seco... Cut, No. 2 to Smooth.

Length—The length of a file is measured from the heel to the point. This... not include the tang.

When Ordering Files—Give definite information as to length, name and ...

(CONTINUED ON OTHER SIDE)

Correct use of tools . . . makes work easier . . . saves vital material

34 FREE Disston Conservation Control Cards

help SAVE TOOLS AND MATERIALS... SIMPLIFY SUPERVISION SPEED PRODUCTION

The present emergency calls for the utmost in output with the greatest possible saving in tools, time and materials.

The Disston Conservation Control Plan will aid you in war time production effort with Instruction Cards, like the illustration. Each of these 34 cards covers a different type of cutting tool. On the face and reverse of each card is practical, expert information to correct faults in operation, avoid failures and prevent waste. Recommendations are made for the selection, adjustment and repair of tools—to lengthen tool life, improve workmanship and product, and avoid delays.

Many plants are reporting that Disston Conservation Control Cards are proving a valuable means of reducing breakage, increasing efficiency, simplifying supervision, and expanding production.

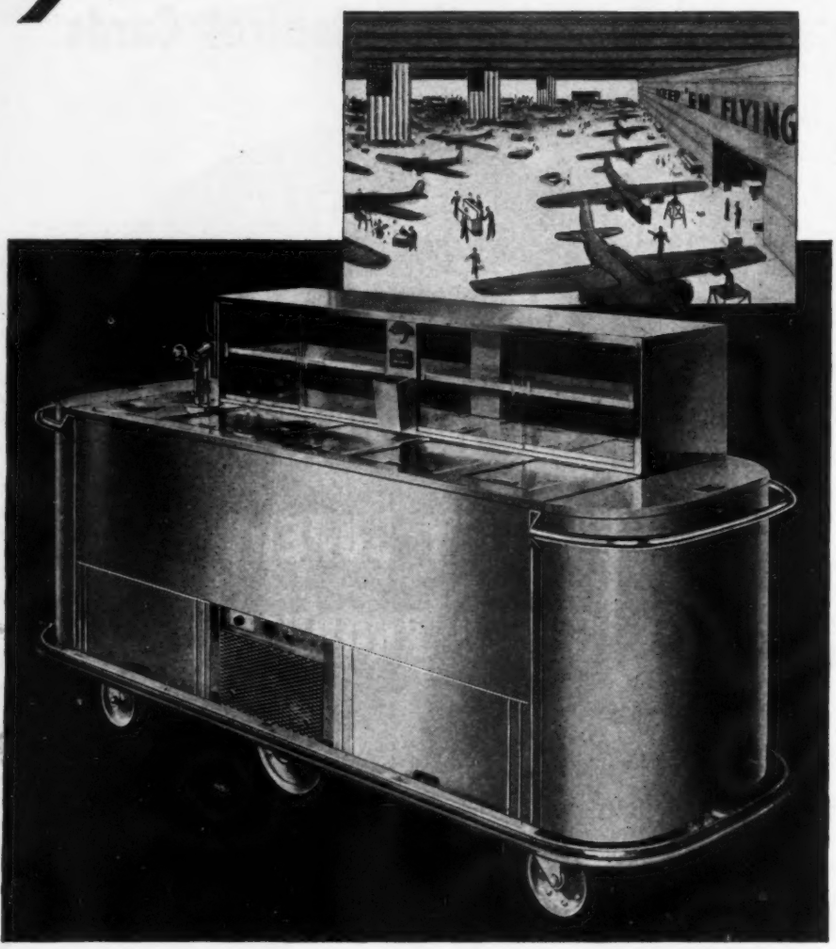
You can apply these cards in your plant without cost or obligation—whether or not you use Disston products. Order the quantity and type required and they will be sent promptly. Free Conservation Control Plan posters, stickers and lapel buttons are also available without charge.

Join the national War on Waste! Send *now* for the free booklet on the Disston Conservation Plan. Write to Henry Disston & Sons, Inc., 524 Tacony, Philadelphia, Pa., U.S.A.

THIS FREE BOOKLET

tells you about the Disston Conservation Control Plan and contains reproductions of Instruction Cards, Order Blank and descriptions of other free material. Send for it *today!*

FOOD "GOES FURTHER" THAN EVER BEFORE IN *Ideal* ROLLING CAFETERIAS



This Ideal Model C-1030 is justly popular. Serves all hot and cold foods. Ruggedly built, it will outlast your factory. Keeps food hot or cold, as desired, when idle.

● **The valuable advantages of bringing food to the worker instead of sending the worker to the food are sharply highlighted by Ideal Rolling Cafeteria service in the great new war industries plants where immense distances and vast areas demand complete mobility in food service equipment.**

In these great plants, as well as in the average factory, Ideal Rolling Cafeterias save workers' time, save floor space, reduce accident risk, avoid food waste and enhance morale.

Ideal Rolling Cafeterias carry and store all hot and cold foods, serving complete meals. Not a lunch cart or a candy wagon, they are *exclusively* electrically heated and refrigerated. The Ideal is truly a cafeteria on wheels. Many standard models meet every need. Write for specifications.

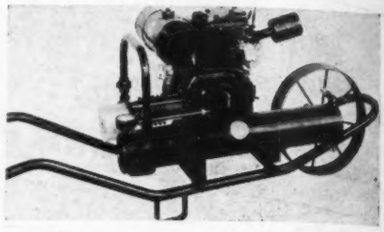
THE SWARTZBAUGH MFG. CO. TOLEDO, OHIO

DISTRIBUTED BY THE COLSON CORP. ELYRIA, OHIO

easily carried about the plant and plugged into any ordinary 110-volt a.c. circuit. Insulated throughout, and is approved by the Underwriters' Laboratories. Acme Electric & Mfg. Co., Cuba, N. Y.

Air Compressors

Portable, gas-driven air compressors, 3 and 4 hp., with wheelbarrow carriers, are designed for war camouflage work on the



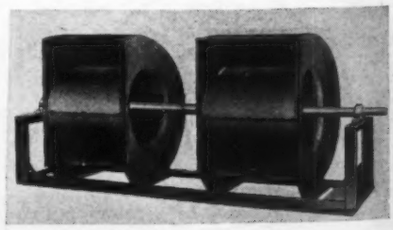
roofs of buildings as well as for general maintenance painting, waterproofing, masonry repointing. P. K. Lindsay Co., 43 Charlton St., Everett, Mass.

Blackout Partition

Folding fabric blackout partition provides a means of conforming to blackout standards and at the same time permits access to and exit from lighted buildings. Works on an accordion-like principle, assuring unusual flexibility. The partition derives its accordion-like operation from the hinge-lock, self-spacing hinge plate at the top. Folding on itself, it has a roller assembly traveling easily on an overhead track. A vertical pipe connected to the lead trolley and extending to approximately 6 inches from the floor, concealed in a loosely fitted front hem, gives rigidity to the front of the partition and serves as a standard. No handles, pulls, or assist ropes are furnished. The flameproof blackout fabric is attached with grommets at the top and to one side of the hinged plates—hanging free. The height of the fabric is 2 inches greater than the height of the room, dragging the floor and assuring adequate coverage. Valances are provided for each side to insure a perfect lightlock. The partition is attached to the wall with screws or nails to a covered wooden cleat extending the full length of the partition. When not in use, the partition can be folded to the wall. Adequate provision has been made for the ingress and egress of trucks and people. New Castle Products, New Castle, Ind.

Motor Blower Units

Motor blower units in a wide range of sizes, applicable to industrial and commercial ventilating, drying, heating, cooling, exhausting, processing, and air con-



Everything we conserve actually adds to our production!

This helpful book covers:
Engineering the drive ★ Installations ★ Slippage ★ Repairing Belts ★ Belt Dressings ★ Storage ★ Standard Reference Tables and Formulas.

FREE BOOK *your belt men need!*

It is our belief that the greatest service we can render in this production drive is to broadcast factual data that will make belts last longer and produce more. Accordingly, we have prepared a pocket-size manual on belt care, covering briefly and clearly the essentials of proper design and maintenance of leather belt drives.

This booklet is offered freely to concerns which wish to have copies for their maintenance men as a guide to proper care of leather belts. Longer life without costly down-time means increased production, which you can count on when high grade leather belts possessing high coefficient of friction are wisely installed. Sign and send the coupon below to–

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TREADED
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GENTLEMEN:
Please send me a copy of your booklet "How to Make Your Leather Belts Last Longer . . . . Produce More!"

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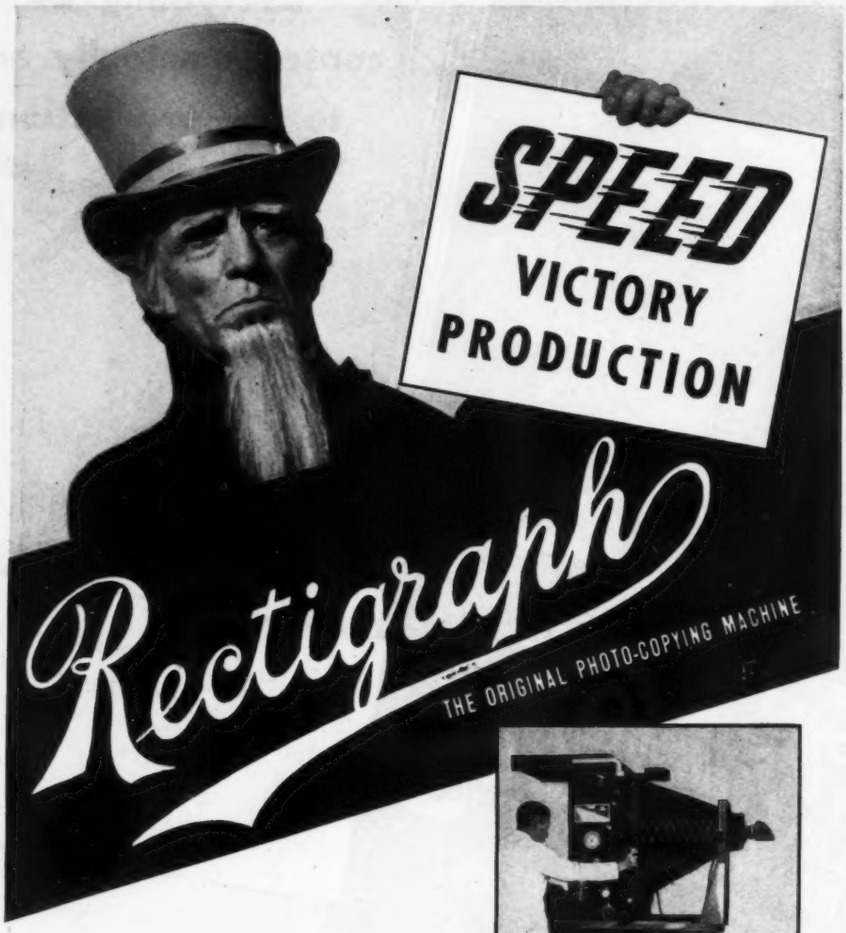

PHOTOCOPY Blueprints,
Flow Charts, Contracts, Designs, Payrolls, Statistics, Records, Plans, etc. ***In Actual, Reduced or Enlarged Size.***

In the battle to produce more planes, tanks, ships and other vital war material . . . FASTER . . . Rectigraph is proving invaluable to hundreds of concerns both large and small. Modern—speedy—efficient, Rectigraph produces "exact" photographic copies of anything written, printed, drawn or photographed, in any scale, singly or in quantities . . . at low cost. Simple to install and operate in full daylight, Rectigraph is a self-contained unit delivering finished prints . . . requires no darkroom or inefficient trays.

Clearly legible facsimiles of drawings, plans, charts, blueprints, small parts, etc. . . . in any scale . . . are quickly available to key men—help control, co-ordinate and expedite production. Uniform reductions of unwieldy papers provide convenient handling, filing and mailing. Photocopying is excellent for copying blueprints when originals are unavailable.

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☞ *Rectigraph can save you important time and money. Thorough investigation is therefore sound. Write for complete facts. No obligation, of course.*

HALOID
MAIN PLANTS AND OFFICES
648 Haloid St., Rochester, N. Y.
BRANCH OFFICES IN PRINCIPAL CITIES

ditioning requirements, are announced. Available in 16 models, 1-, 2-, and 3-fan assemblies to meet resistance up to 4 inches static pressure, and in capacities from 880 to 42,600 cubic feet per minute. Fan speeds range from 300 to 1750 r.p.m. Blowers may be secured with or without casings. They are belt driven or direct connected, and are especially designed for simplified application to duct systems. Units are available in two series of fan designs. Series 1100 gives large volumes of air with quiet operation at low fan speeds for static pressures up to 1½ inches. Series 1200 meets the resistance of duct systems and special conditioning equipment, protecting motors from overload by a retarded horsepower curve for static pressures up to 4 inches. Niagara Blower Co., 6 E. 45th St., New York.

Blackout Material

Material, known as Air-Aid, combines qualities of blackout and shatterproofing with permanent self-adhesiveness, it is claimed. Impervious to light, easily applied, removed, and reapplied. Application requires no special skill. It is clean to handle and does not mar glass or wood finishes. Non-reflective, and has tensile

strength to withstand pressure, and hold together shattered fragments of glass. Not affected by light, extreme dryness, moisture, or high or low temperatures. Adheres to any clean, smooth, hard, dry surface, and can be removed easily by peeling off. Available in rolls of various widths, and can be cut to any desired length. Defense Material Div., Chicago Show Printing Co., 2635 N. Kildare Ave., Chicago.

Plug-in Telephone

Designed especially to facilitate moving of stations and expansion of the automatic interior telephone system, this telephone may be plugged into any terminal box, which requires only a single strand of triple-conductor wire to be run to the Select-O-Phone switchboard, no cable being used. Instrument may be used in the same system with loudspeaking name-touch executive stations. Center of the dial is a code ringing button which is pressed to code signal where several persons may be served by one telephone, or when using the built-in general call paging circuit. All

"Welding saved me $1 on that tankful"

What's the idea of giving me the welding nod every time I buy gasoline?

ALTER EGO: Just because you're searching through today's welding achievements for help in developing a crash-proof business for the future. So, look into the modern oil refineries for a cue.

That's right, they're all-welded so that they can work at higher pressures and thus turn out more gasoline per gallon of crude.

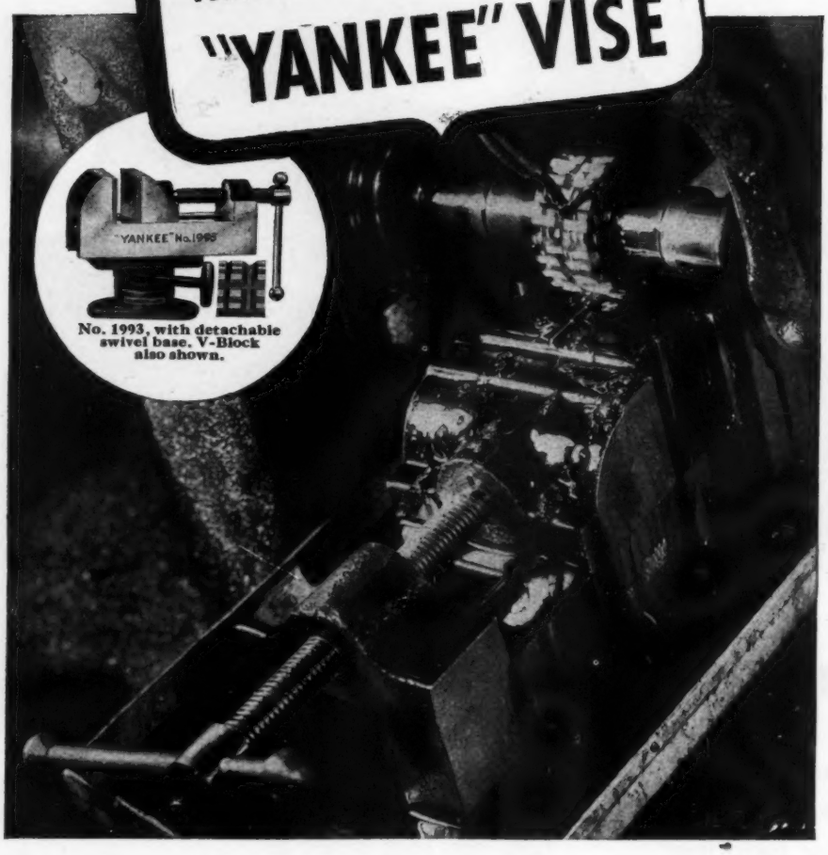
ALTER EGO: To be more specific, they've *doubled* the yield from crude, which cuts costs at the pump 5 cents per gallon. That's how you just saved $1.

Then why couldn't we put that same basic idea to work to boost the quality and cut the cost of our *product.*

ALTER EGO: We *could* if we *would*. All it takes is the *will* and the *way*. I'll furnish the will. You can get the *way* from The Lincoln Electric Company, Cleveland, Ohio. Just ask them for their Change-over Plan. Understand they GUARANTEE it to work, so there's nothing to lose — everything to gain.

ALTER EGO: Literally, "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.

FEWER OPERATIONS mean
FASTER MILLING with the
"YANKEE" VISE



No. 1993, with detachable swivel base. V-Block also shown.

Cut out waste motions—they are costly and time-consuming! The "Yankee" Vise is designed to speed production. Once work is squared on face plate or machine bed it *stays* squared because the sides, front end and base of the "Yankee" Vise are accurately machined. If work must be moved from bench to drill press or milling machine, it can be done quickly and easily without realignment. The same vise can be used for round stock, simply by inserting a hardened steel V-block that's furnished as standard equipment. All these "Yankee" features save time and production costs.

Order from your supply house . . . or write North Bros. Mfg. Co., Dept. FMM-5, Phila., Pa., U.S.A.

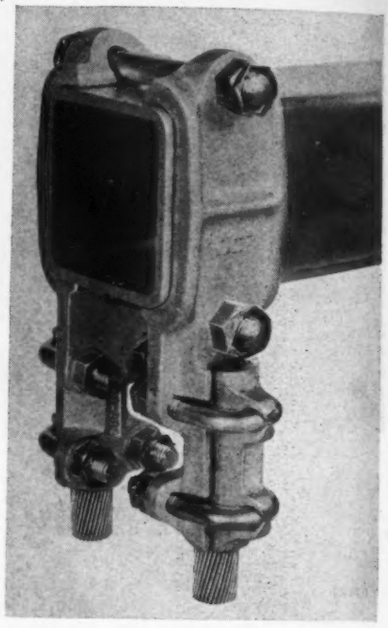
"Yankee" Vises are made in four jaw widths and two styles. No. 991—1½"; No. 992—2"; No. 993—2¾"; No. 994—4". These same sizes with the detachable swivel base feature are Nos. 1991, 1992, 1993, 1994.

"YANKEE" TOOLS
make good mechanics better
NORTH BROS. MFG. CO., Phila., U.S.A.

plug-in telephones are interchangeable. Dialing any number automatically connects to the desired party in a secret conversation. Provision is also included for secret conference among three or more persons. Capacity: 5 to 55 lines, with extension possibilities to 100 or more stations. Select-O-Phone Co., 1012 Eddy St., Providence, R. I.

Clamp-Type Connectors

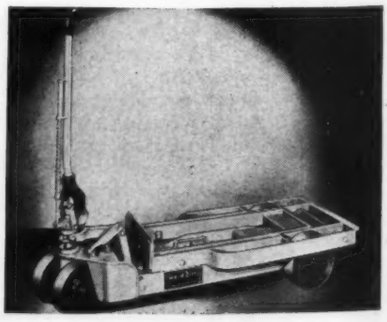
A feature claimed for cast-to-size connector is the unyielding anchorage afforded by heavy lugs for the high strength Duronze



bolts. Heavy ribs insure high pressure multiple point contact at each corner of the tube. Delta-Star Electric Co., 2400 Block, Fulton St., Chicago.

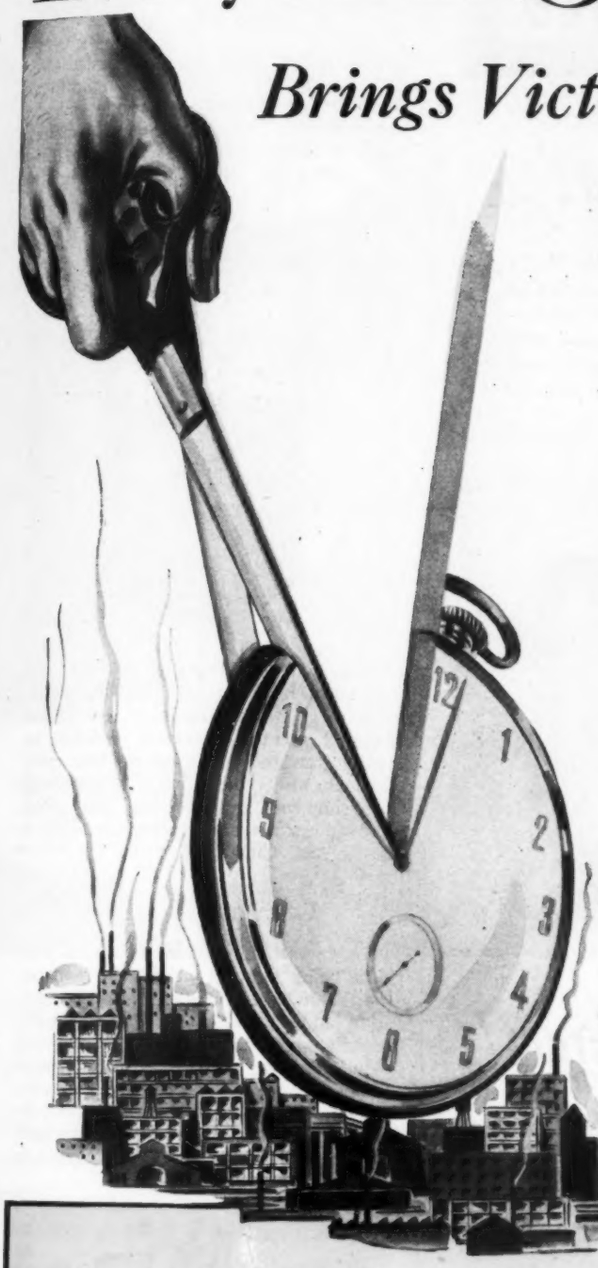
Heavy-Duty Hydraulic Lift Truck

Built for easier handling of loads as high as 10,000 pounds, the Weld-Bilt hydraulic unit is mounted in a horizontal position beneath the platform, where it is not subjected to bumps and shocks. Pumping mechanism is so designed that little effort and only short strokes of the handle are required to lift the platform. Finger-tip controls are provided at the handle. Foot release lowers platform gently and smoothly. Built for hard use and heavy loads. Completely arc-welded construction, heavy structural steel platform and



Every Hour *Saved* in Industry

Brings Victory One Hour Closer!



BACK in the days before Pearl Harbor a 60-minute hour was all right. Now everything is changed. More production minutes crowded into an hour means more hours saved in a day—and every hour saved brings victory that much closer.

For example: One manufacturer was using 35 seconds on the assembly line to fill differentials with grease. Alemite showed him how to meter the exact amount needed into each differential—*in 15 seconds!* A better job—under better control—in less than half the time! *That's crowding extra minutes into every hour!*

Give yourself this quick quiz: 1. Are *your* machines halted for lubrication? 2. Are breakdowns stealing vital production time? 3. Are power costs too high? 4. Is contamination a problem? 5. Are you having lubrication difficulties caused by heat, cold, or chemicals?

The chances are that an Alemite lubrication expert can help you increase your output—simply by pointing out where peace-time lubrication methods are *stealing vital hours* from war production. For quick action, wire or phone direct! No obligation!

ALEMITE

REG. U. S. PAT. OFF

1880 Diversey Parkway, Chicago, Ill. • Belleville, Ontario

Another Product of STEWART WARNER

Industrial LUBRICATION

Ask Anyone in Industry!

ALEMITE MODEL 6190
25-LB. ELECTRIC POWER GUN

Delivers 12 ounces of semi-solid lubricant per minute under high pressure. Nitralloy high pressure piston and cylinder. Heavy duty universal motor; easily portable; complete with hose and valve.

ALEMITE 6700 SERIES
BARREL PUMPS

. . . comprise a complete range of heavy-duty pneumatic pumps, available for high, medium, or low pressures. Handle heavy greases direct from original drums, with ample capacity to serve several outlets.

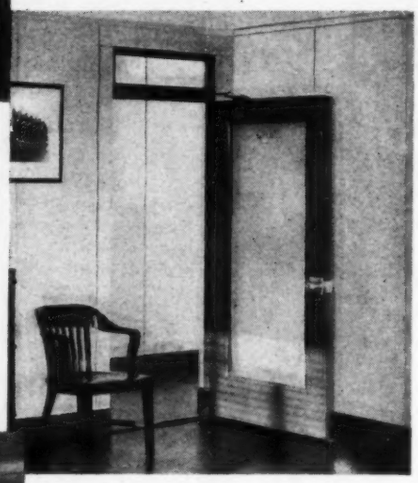
ALEMITE MODEL 6528
40-LB. AIR-OPERATED GUN

Operates on 100 to 150 lbs. air; handles heavy fibrous grease at 33 times air pressure used; exclusive helix arm and worm assures positive prime—no air pockets.

Save Time building plant offices . . . use J-M TRANSITE WALLS

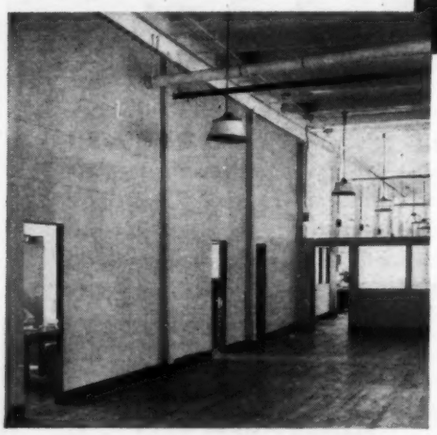
Quickly Installed!

Johns-Manville Transite Walls are installed *dry*, without dirt or disturbance. Because of the simple construction method employed, *installations can be made without interfering with plant or office routine.*



Easily Moved... Complete Salvage!

The construction method permits complete salvage of all materials . . . makes relocation as easy and rapid as initial erection. *The office at right has been relocated four times with the same Transite Walls!*



Solid and Fire-Resistant!

Made of asbestos and cement, Transite Walls are incombustible and provide the privacy and permanence of fixed walls. Unusually tough and durable, they are virtually abuse-proof. They can be left in attractive natural gray finish, or painted as desired.

Transite Walls release critical materials for war use, because they are composed principally of asbestos-cement sheets. For full details, write for catalog TR-22A. Johns-Manville, 22 East 40th Street, New York, N. Y.

JM Johns-Manville
TRANSITE MOVABLE ASBESTOS WALLS

base, heavily cross-braced for extra rigidity. Ball and roller bearings provide easy mobility at a minimum of effort. Wide and narrow platform models available. West Bend Equipment Corp., West Bend, Wis.

Guard House

Insulated steel guard house is constructed of heavy-gage arc-welded steel, and comes completely assembled, in two standard sizes—48 and 54 inches square. Ceiling height is 6 feet, 10 inches. Wall surfaces and ceiling are insulated. Building is

mounted on a heavy wood floor, and has four-way vision. Is adequate protection for guard in all weather. Storm and fireproof, and easily portable. Building includes glass and putty, bronze Yale cylinder lock, utility shelf, and is shipped with one shop-coat of battleship gray paint. The Edwards Manufacturing Co., Fifth & Butler Sts., Cincinnati.

Vacuum Cleaner

Tornado vacuum cleaner, Model 117, besides being light in weight and portable, has the added features of high-speed operation and durability, it is claimed. Especially suited for continuous, heavy-duty cleaning. Does not use commutator or carbon brushes, thus permitting continuous operation. The high rate of speed develops suction strength required for picking up welding flux, scrap, heavy particles

"..and KEEP YOUR POWDER DRY!"

IT was in 1642 that Oliver Cromwell admonished his never defeated British army, the Ironsides; "Put your trust in God, and keep your powder dry." That order applies equally today as when soldiers carried powder horns.

...FIBREEN is Keeping America's "Powder" Dry on Land and at Sea—

Powder, today, means shells, grenades, and bombs—and also planes, tanks, food, clothing, radios, range finders, surgical equipment, medicines and chemicals, electrical supplies; in fact, all the complicated equipment of modern warfare.

Damage to any of this material while in storage or in transit, while exposed on shipping platforms or yards, at docks or at supply dumps, can be just as disastrous, today, as water in the powder horns of Cromwell's musket men in 1642.

FIBREEN is doing its part in providing safe packing and protection for goods of war. It's tough and strong. It's waterproof. Used as a liner or wrapping, it furnishes vital protection, guarding against damage by rain, dirt, sea water, salt air, and long exposure to all kinds of weather from extreme heat to freezing cold.

FIBREEN is a pliable, rugged paper—reenforced by wire-tough, closely spaced fibres running crosswise and lengthwise — embedded in two layers of asphalt, between two layers of strong kraft. It's inexpensive—an effective replacement for packing fabrics and materials no longer available.

FIBREEN is available to those in essential industries. If your product is in this class, write explaining what you make, and how it is now packed. We'll try to help you.

THE SISALKRAFT CO.

Manufacturers of Sisalkraft, Fibreen, Sisal-X, Sisaltape and Copper-Armored Sisalkraft.

205 W. WACKER DRIVE · CHICAGO, ILL.
NEW YORK SAN FRANCISCO LONDON SYDNEY

In Canada Write to Alexander Murray & Co., Limited, at Montreal · Toronto · Halifax · Saint John · Winnipeg · Vancouver

FIBREEN
EFFECTIVE *Protection* IN TRANSIT—
IN STORAGE—FOR EMERGENCY USES

SERVING INDUSTRY, CONSTRUCTION AND AGRICULTURE THROUGHOUT THE WORLD

Double Eddy says:
Can your business afford NOT to reclaim its dust
DOUBLE EDDY
★ Symbolizing the harnessed power of the double eddy current..an exclusive advantage of the Buell (van Tongeren) Dust Recovery System.

Another Buell Collector being installed

MATERIAL SAVED PAID FOR ONE BUELL DUST COLLECTOR IN JUST 13 MONTHS!

Aside from dollar value, many of industry's materials today are precious, hard to come by. Every scrap, every dust particle must be saved. For example, in the production of tin, aluminum, magnesium, potash and other vital materials, Buell Dust Recovery Systems offer an efficient, economical method of reclamation at every point where dust is created — in pulverizers, dryers, sprayers, kilns, etc.

Many Buell installations quickly pay for themselves in material saved. You incur no obligation by asking for information about the many advantages of the Buell (van Tongeren) system of dust recovery —advantages in high efficiency, dependable operation, long life and negligible maintenance costs.

We shall be glad to send you on request, a copy of our informative 24-page "Bulletin FA-5, Dust in Industry".

BUELL'S 6 PLUSES

Buell (van Tongeren) Dust Recovery Systems offer every user these six plus advantages . .

- + *High Recovery Efficiency*
- + *Low First Cost*
- + *Low Maintenance*
- + *Unlimited Capacity*
- + *Long Life*
- + *Fractional Efficiency Performance Guarantees*

...all good reasons why so many of America's leading industrial concerns prefer Buell.

BUELL ENGINEERING COMPANY, Inc.
12 Cedar Street, New York

Nation-wide service through offices of either Buell Engineering Co. or B. F. Sturtevant Co.

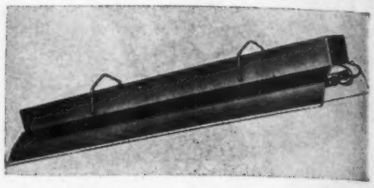
CONSULT BUELL *First* IN DUST RECOVERY
for Chemical • Rock Product • Metallic • Food • Flue or any other dusts

buell DUST RECOVERY SYSTEMS

of dust or dirt, water, and other materials or debris. Hi-cycle motor is made to operate on 220-volt, 180-cycle current only. Unit is equipped with 20 feet of 4-conductor cable, but without socket or attachment plug. Breuer Electric Mfg. Co., 5100 N. Ravenswood Ave., Chicago.

Fluorescent Luminaire

Among the features claimed for the Compco R-F Luminaire are (1) low installation cost; (2) no lamp starters (low



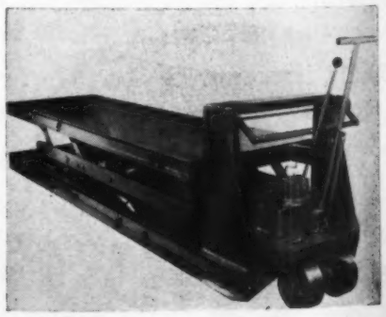
maintenance cost); (3) no "strob"; (4) more efficient lighting. The Commercial Metal Products Co., 2251 W. St. Paul Ave., Chicago.

Transformer

There are specific applications where air-cooled transformers are the quickest way of preparing a plant for 24-hour-a-day work. Only one general wiring system is required. By tapping an air-cooled transformer to the power line at the point where a lighting circuit is required, voltage is reduced from the power potential to the necessary lighting requirements. Eliminates metering lighting and power load separately. Air-cooled transformers do not contain oil, thereby saving in oil replacement, continual inspection, and lessening the fire hazard. The 2400-volt air-cooled transformers are available in sizes from 1.5 kva, in single-phase design and from 3 to 50 kva. three-phase design. Can also be furnished in three-phase designs with primaries of 240/480 and 600 volts in sizes from 3 to 50 kva. The 2400-volt primary transformers are designed with 5 percent taps in sizes from 5 to 50 kva. This will allow for voltage correction to compensate for voltage-drop where lines are carried over an extended area. Acme Electric & Mfg. Co., Cuba, N. Y.

Elevating Truck

Heavy-capacity, hand-operated hydraulic truck for handling long strips of sheet metal is designed to keep metal at a convenient height for the operator while he is feeding the sheets to a punch press. Maxi-



MANHATTAN OFFERS HELP

to make your Mechanical Rubber

DO MORE · LAST LONGER

For industry, this is a war of conservation of production equipment—especially of equipment that is becoming difficult to replace—like mechanical rubber goods.

These include such widely different necessities as power transmission belts—both of the flat and V types; conveyor belts to transport the materials of industry and construction; hose for water, steam, air, oil, gasoline. There are thousands of other items of rubber equipment or parts important for Victory.

Because of its wealth of experience and research, MANHATTAN is able and glad to help you make the mechanical rubber goods you now have last longer.

MANHATTAN field representatives, service men and the trained personnel of its distributors are all available to help by specific suggestions.

IMPORTANT SUGGESTIONS

BELTS

Keep pulleys clean, in good condition and in correct alignment so that belts will run true and wear evenly.

A belt that is too tight may cause fastener and bearing trouble. If too loose, may slip and wear.

Use belt dressing on flat belts only when essential and then as recommended by rubber manufacturers.

Too high temperature will shorten belt life.

Oil deteriorates rubber belts.

Tight side down gives greater arc of contact, delivers more power.

Use right size and type belt, install correctly and use proper type and size fasteners.

Too small pulleys may shorten life of belt.

Rubber belts should be stored in a cool, dark place.

Write factory or ask distributor to send a MANHATTAN service man.

CONVEYOR BELTS

Make sure idlers turn freely and are lubricated properly so oil or grease will not injure belts.

Avoid long drops for heavy materials.

Load evenly and centrally. Irregular, uneven or heavy loading causes spillage, also tends to make belt run crooked and wear unevenly. Hard or jagged pieces passing between pulleys and belt will damage the belt.

Don't overload or overspeed conveyor.

Use end pulleys of ample size.

A MANHATTAN field engineer or service man will be glad to examine your installation. Write factory or distributor.

HOSE

Avoid sharp bends at fittings; also twists and kinks in body of hose.

Attach couplings carefully, forcing shank straight into hose, using soap and water lubricant.

When not in use, roll up or suspend hose.

Do not let hose lie in sun, hot or damp places.

Do not permit heavy objects to run over hose.

Avoid excessive temperatures, violent fluctuations of pressure.

Straighten hose before dragging and while unpacking. Do not forcefully bend, twist, kink or pull hose.

Use the correct type and size hose for the conditions.

Store in dark, cool place.

Consult MANHATTAN service man.

KEEP AHEAD WITH

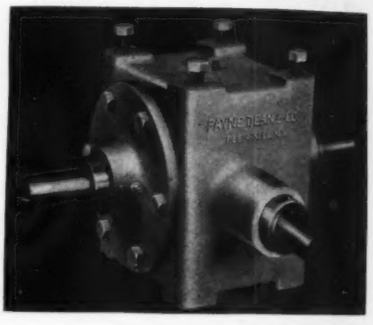
THE MANHATTAN RUBBER MANUFACTURING DIVISION
of RAYBESTOS-MANHATTAN, INC.
EXECUTIVE OFFICES and FACTORIES • • • PASSAIC, NEW JERSEY

ACE
under all air pressures
HANSEN Push-tite
AIR HOSE COUPLINGS
HANSEN MFG. CO.
Hansen Push-
Tite air hose couplings
have won their spurs in action
on thousands of industrial production
lines. Regardless of the air pressure they are
absolutely air tight, no leakage, no waste of air.
Slight push of plug into socket it is connected,
sealed and air is automatically turned on, a slight pull
back air is automatically turned off and coupling is dis-
connected. Requires no effort and there is none of the
usual waste of time in turning and twisting of parts in
order to connect or disconnect. Complete swivel ac-
tion eliminates the customary problem of kinky hose.
• Hansen Push-Tite air hose couplings are also
widely used for oil and grease lines and work
efficiently on all three...air, oil and grease
lines. • Send for new free catalog
on the Hansen Industrial Air
Line Equipment.
Hansen MFG. CO.
INDUSTRIAL Air Line EQUIPMENT
1786 EAST 27TH STREET • • • • CLEVELAND, OHIO

mum capacity 10,000 pounds, with a two-speed hand-operated hydraulic pump. Equipped with an attachment so that a towing hitch may be mounted on the front wheels to move the truck with an industrial power tractor. Floor lock enables truck to be locked in position when the operator is feeding the sheets into the punch press. Toggle level type truck, 10,000-lb. capacity, has a table 36x120 inches, lowered height 18 inches, elevated height 36 inches, fifth-wheel steer, with two-speed hydraulic hand pump, front fork arranged for installation of towing hitch. Can be furnished in other capacities and specifications, and also with motor-driven pump. The Lyon-Raymond Corp., 894 Madison St., Greene, N. Y.

Axle Drive

Miter gear drive with a 1 to 1 ratio, for changing the direction of any shaft, through an angle 90 degrees. Driving or driven shafts may be set to work in either horizontal or vertical position, for floor, wall, or ceiling mounting, a universal base being provided for any position. With universal joints, almost any angle of drive



may be obtained, it is claimed. Oil-tight in any position, Series ADS will transmit 5 hp. at 600 r.p.m., and series ADH, 5 hp. at 1200 r.p.m. The projecting shafts, which are 1 inch in diameter, may be made of any length, although 3 inches is the standard, with provisions for 5/16-in. key. Bearings are of bronze, lubricated with pressure fittings on the slow-speed units, and antifriction ball or roller in the high-speed series. Case measures 6½x7½x8¼ inches, and unit weighs 50 pounds. Payne Dean Co., Peekskill, N. Y.

Street-Lighting Luminaire

Designed for lighting streets in the vicinity of war production plants, and for protective lighting of fences around industrial areas, street-lighting luminaire, Type SG-10, is announced. Reflector housing is heavy-gage steel porcelain enameled inside and out with a ground coat, and one outside coat of green enamel. A silvered glass reflector, instead of aluminum, contributes to the high reflectivity of the unit, has a metallic backing that will not chip or peel off under extreme heat conditions. For symmetric distribution three globes are available; long blown globe in clear or alabaster glass; short blown globe in clear or alabaster glass; or short pressed globe in clear glass. For asymmetric distribution, refractor globes are available in four de-

You profit from *our* experience

Never satisfied with making just *good* products, the Frank Adam Electric Company, for over fifty years, has been producing electrical equipment *built better than necessary* . . . Now, with long-experienced personnel, and with precision machines of the most modern design, we are equipped to meet all requirements of defense — including accuracy and high quality — and to meet them with dispatch . . . The many industries — great and small — using (FA) Electrical Products have found them efficient, reliable and economical — good for a long life of satisfactory service. It is certain that they will serve you as well — that *you* will profit from *our* experience.

— *These Informative Bulletins Will Help You* —

in the preparation of plans and specifications for your electrical distribution system, whether for new construction or modernization. Complete information is given regarding each type of equipment. Write today for the ones in which you are interested:

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(FA) Dublbrak Circuit Breaker Panelboards and Cabinets.

16 pp. Illustrations, dimensions, capacities, prices, and suggested specifications.

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(FA) Busduct Feeder & Plugin Types.

20 pp. Modern electrical distribution system described and illustrated. Complete with details and specifications.

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(FA) Shutlbrak Enclosed Switches, interlocking and non-interlocking.

16 pp. complete descriptions, dimensions, capacities, prices and specifications. Also describes Shutlbrak Switch Switchboards.

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(FA) AC Circuit Breaker Service Equipment, Load Centers and Panelboards.

20 pp. Includes capacities, dimensions, prices, wiring diagrams, illustrations and suggested specifications.

Illustrated Bulletins on other (FA) Products are in preparation.

If you wish several of the above, a sturdy binder will be included. Check the ones you want, sign your name and address on the margin, and mail this page to Frank Adam Electric Company, St. Louis, Mo.

EST. THE SIGN OF A FA 1891 BETTER JOBS

Frank Adam

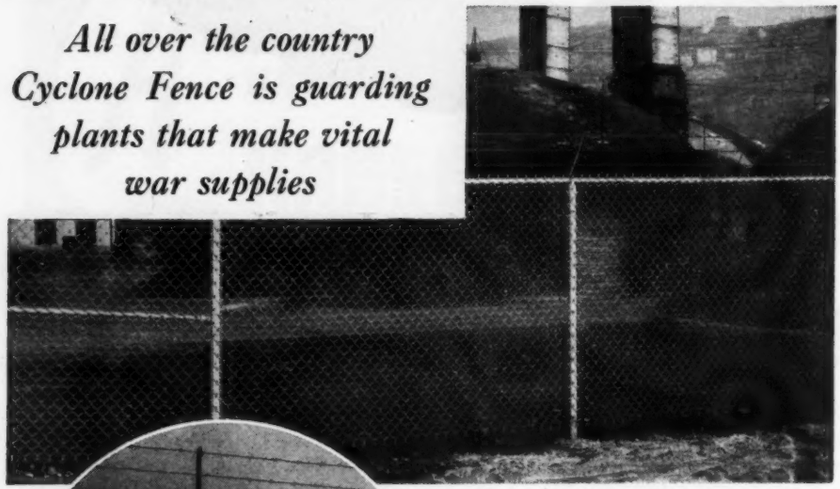
ELECTRICAL PRODUCTS

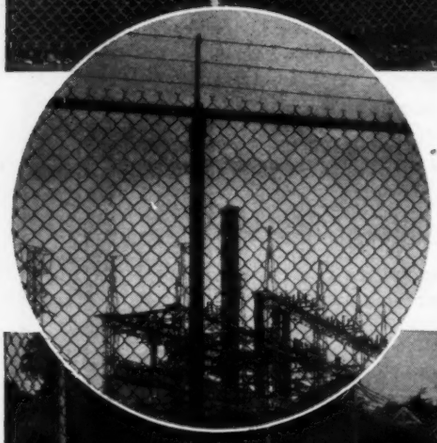
for Defense Industry

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

BAD NEWS FOR SNOOPERS!

All over the country Cyclone Fence is guarding plants that make vital war supplies





What greater discouragement could saboteurs and thieves find than this sturdy enclosure of Cyclone Fence? It is one sure way to prevent trouble before it begins.

The barbed wires on top of Cyclone Fence certainly make it tough to get in—and they are sure to spoil the getaway. Barbed wire extension arms are available in several types.

Day and night, Cyclone Fence is on the job—guarding the entire plant, yard inventories, railroad sidings and other important places around the plant.

When the entire plant is fenced in, your watchmen can do a better job. No one can slip in a side door or a rear driveway when all persons and materials must enter through guarded gates.

SPIES and trouble-makers do not like Cyclone Fence. But safety directors, presidents and other industrial executives certainly do. For they know that this sturdy barrier of steel has helped them keep snoopers, saboteurs and thieves out of their plants.

U·S·S Cyclone Fence is made with ruggedness that means long service and low maintenance. It is constructed on sturdy steel posts, set in concrete bases frost won't budge. Gates swing freely—for the weight of the gate is supported on a special ball-and-socket hinge set in concrete.

Does your plant have this important protection? Is every foot of property line guarded against intruders? If not, let us help you work out a complete plan. We will help you choose the right type of fence and gates—and submit estimates.

CYCLONE FENCE DIVISION
(AMERICAN STEEL & WIRE COMPANY)
Waukegan, Ill. · Branches in Principal Cities
United States Steel Export Company, New York

USS **CYCLONE FENCE**

UNITED STATES STEEL

32-Page Book on Fence

Send for our free book on fence. Crammed full of facts, specifications and illustrations. Shows 14 types — for home, school, playground and business. Buy no fence until you see what Cyclone has to offer.

CYCLONE FENCE
Waukegan, Ill., DEPT. 952

Please mail me, without obligation, a copy of "Your Fence—How to Choose It—How to Use It." I am interested in fencing: ☐ Industrial; ☐ Estate; ☐ Playground; ☐ Residence; ☐ School. Approximately _____ feet.

Name _____

Address _____

City _____ State _____

signs—C-way distribution for narrow streets; B-way distribution for wide streets; two-way distribution for center mounting; and a four-way distribution for intersection center mounting—clear glass with the prisms on the inside and rectilinear design on the outside.

Unit is available for series or multiple service. Can be equipped with high or low-voltage metal head for internal or external wiring, top or side mounting. Westinghouse Elec. & Mfg. Co., Edgewater Park, Cleveland.

Power Circuit Transformers

For operating 115-volt devices from 230, 460, or 575 volt power circuits, indoor air-cooled power circuit transformers to include capacities from 25 to 150 va. inclusive, are announced. Designed to provide 115 volts for operation of lighting circuits, individual lighting for machine tools, welding machines, and other production machinery, and for 115-volt electrical devices such as small motor-driven equipment, magnets, controls, relays, and the like. Transformers are self-contained, equipped with roomy wiring compartment for primary and secondary connections, thoroughly insulated for safety. Listed as standard by Underwriters' Laboratories, Inc. Where lower voltage lamps are employed on machines, transformers with 32-volt secondaries are available. Jefferson Electric Co., Bellwood, Ill.

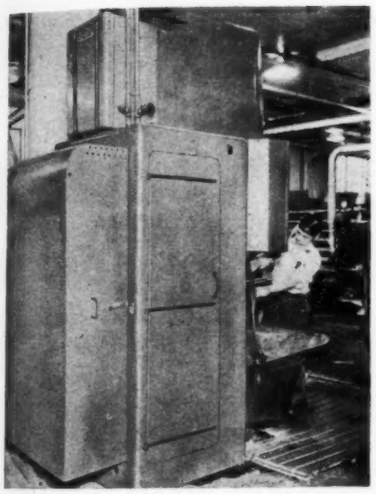
End Brush

A power-driven end brush is designed particularly to facilitate cleaning slag, scale, or oxidation from welds on inside corners

and other locations that are difficult of access. Will get into any space that is accessible for welding. Can be used in all standard power tools, air or electric. Brush proper measures ½ inch across brushing surface. Available with three diameters of wire—.025 inch for Type No. 91-S-2, .035 inch for Type No. 91-S-3, and .090 inch for Type No. 91-S-4. The Osborn Manufacturing Co., Brush Division, Hamilton Ave., Cleveland.

Breakers for Co-ordinated Welding Machine Design

Air circuit breakers which can be incorporated as an integral part of resistance welding machines by their manufacturers are now available. Designated Types AE-1AY1 and AE-1BY1, they are metal-inclosed and can fit behind the steel panels of the welder. Breakers can be removed



for inspection by unscrewing two screws in the breaker case. Power is entirely disnected from the breaker when it is removed, providing complete safety for the inspection.

Breakers have a ride range of calibration, offering a choice of trip settings that provide full protection and still allow maximum output of the tube. Can be arranged to open circuit in case of undesirable conditions such as low-voltage or no water flow, and also to close the circuit remotely by a pushbutton. General Electric Co., Schenectady.

Production Control Board

Use of Produc-Trol system enables production and purchasing executives to see all facts concerning raw materials, parts, assemblies, machines, and man-hours, it is

An urgent need in Defense production

Hot foods
Hot soup
Hot coffee
for workers

Here's the low-cost way to provide them

Showing 5 food-pan assembly in vacuum-insulated carrier.

4 standard sizes.

AerVoiD portable vacuum insulated food, soup and... coffee carriers

Vacuum-insulated soup and coffee carriers.

6 standard sizes.

After all, Defense Production narrows down to keeping man-power on the job!

To that end factory managements are beginning to concern themselves with hot foods and beverages for workers . . . something more energizing than "cold lunches" to keep workers fit and to offset production-lag. They realize that both good will and good work are enhanced by hot foods for workers.

for servicing anywhere about the plant, indoors or outdoors

AerVoiD vacuum-insulated food, soup and coffee carriers step into this picture and do a job no other equipment can do. Hot foods and beverages can be kept hot for hours in AerVoiD vacuum insulated carriers, even though transported miles in outdoor cold-weather temperatures. No installation, low first cost, practically no operating cost, affording "throughout the plant" service, one building or 20 acres of buildings. Nearly 100 Defense Plants already use AerVoiDs to supplement cafeterias, to service hot foods without cafeteria setups. Write today for illustrated literature.

VACUUM CAN CO.
25 S. Hoyne Ave., Chicago, Ill.

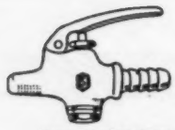
AerVoiDs...keeping American man-power on the job

If You're Making Essential Products We'll Give You Prompt Deliveries

The items illustrated are just a few of the many types of fittings made by this company, for handling air, water, steam, oil, and electricity.

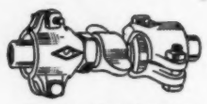
We are equipped for volume production of these fittings, as well as special items of this general character. If you are making war materials or essential civilian goods, we will gladly work with you and give you prompt, dependable deliveries of any type of brass or copper goods that we are equipped to make.

Write for our catalog of Industrial and Electrical Fittings—or submit your special requirements to our engineering department.



Four popular types of simple dependable construction.

AIR NOZZLES



HIGH PRESSURE COUPLINGS

For heavy duty service on steam, air, or water hose.

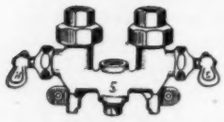
BARREL FAUCETS

Improved design, extra large capacity. Two types of locking levers.

FUSIBLE PLUGS

Patterns to meet most specifications. Also approved Marine, A.S.M.E., and A.P.I. plugs.

INDUSTRIAL SHOWER VALVES



A well-made valve equipped with wall brackets. May be installed with supply pipes either from ceiling or floor. Both inlets and outlets ½" I.P. size.

WATER, STEAM, OIL HOSE COUPLINGS

HOSE CLAMPS

Sizes and styles for every need.

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICH.

Sherman Fittings

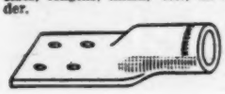
Electrical Fittings—

SOLDERLESS LUGS

Underwriters approved. Simple and easy to install. Size from 35 amps. to 500m CM.

SOLDERING LUGS

Many types and sizes. Special sizes, lengths, finish, etc., on order.



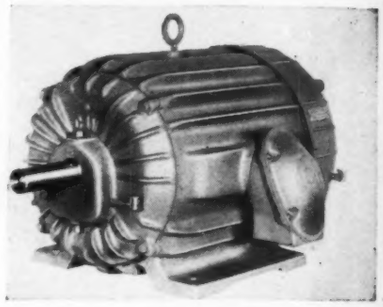
Also . . .

SOLDERLESS CONNECTORS
FIXTURE CONNECTORS
SET SCREW CONNECTORS
SPLICING SLEEVES

claimed. Lists parts, assemblies, subassemblies, or individual operations on a part, at the left of the board. Movable tapes working from left to right on pulleys bring all pertinent facts into instant focus. Double rows of peg holes under the movable tapes, and various colored pegs, permit many arrangements of comparative data and control required for any operation. Can be ordered in sizes to fit specific needs. Models are also available for individual and group incentive plans. Wassell Organization, Westport, Conn.

Inclosed Motors

Known as Cowl-Cooled, motor of modern design is especially adapted for use in dusty locations and for all applications where totally inclosed motors are recommended. Ventilating air is blown over the external ribs, which run the length of the



frame, and is not forced through internal passages, assuring trouble-free operation, even in atmospheres containing excess amounts of destructive fumes, abrasive dust, oil, or dirt. Available in standard NEMA frame sizes up to 20 hp., either ball- or sleeve-bearing equipped. Crocker-Wheeler Electric Manufacturing Co., Ampere, N. J.

Shatter-Resistant Coating

Transparent glass coating that prevents shattering has been developed. In liquid form, ready for use, and can be applied by spraying or brushing. Passes sunlight with little absorption, and weathers without discoloration. Dries quickly, forming a tough film having a tensile strength of from 3000 to 5000 pounds per square inch. Elongation is over 20 percent, permitting considerable movement of the glass without rupture of the film. The Wilbur & Williams Co., Park Square Bldg., Boston.

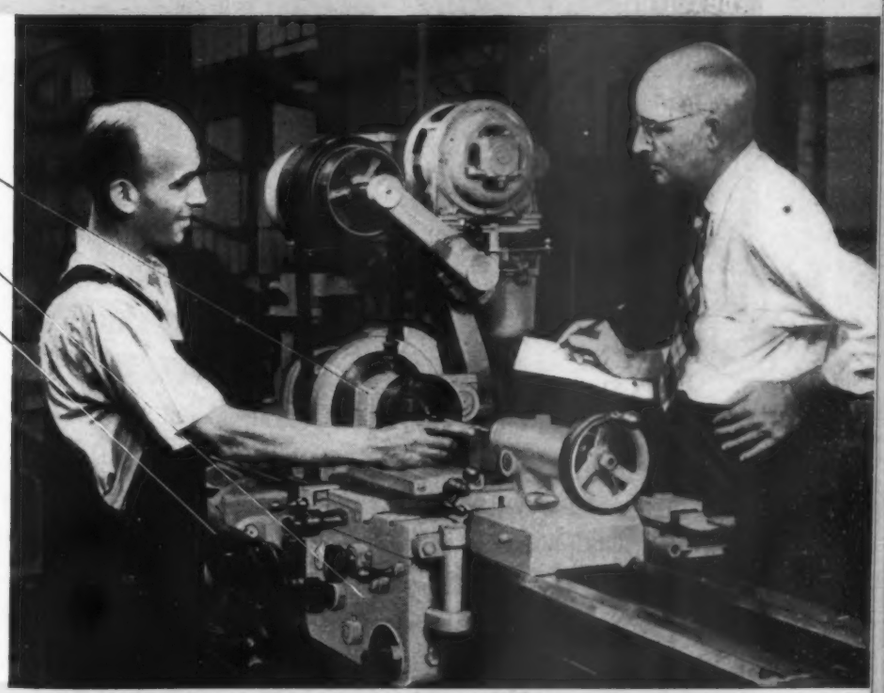
Asbestos Protective Suit

One-piece asbestos protective suit is designed to provide instant and complete personal protection against flame hazards in emergencies. Consists of an upper and lower durable asbestos garment securely sewed together, with helmet, gloves, and boots attached. Prevents the entry of flame, insulates against heat, guards the head from injury by falling or flying material, and enables speedy and effective work at

HOW TO BEAT THE "BLACKOUT" THAT SLOWS DOWN PRODUCTION

▶ This machine shop is well lighted. Yet a "blackout" blankets each machine. The "blackout" is the dark, dull color of the machine which blends with the material being worked. This soaks up the light rays and makes it difficult for the worker to see what he's doing. Results in slow-down of production. Breeds eyestrain. Causes mistakes and accidents. Lowers morale of workers.

TIME STUDY SHOWS MORE OUTPUT WITH *THREE DIMENSIONAL SEEING*



▶ Notice how the machine repainted in lighter colors becomes a *light-reflector* instead of a *light-robber*. The work surface now has *color for contrast* with the material being worked. This also defines the danger area. The worker sees his work in *three dimensions*—sharp and clear. No more dull, flat plane of darkness to pierce. This speeds his production. Helps eliminate errors and mishaps.

ow Du Pont developed this revolutionary new system to give more light for seeing!

REE DIMENSIONAL SEEING meets America's most rgent needs today! It speeds production. It nserves manpower. It saves materials by re-cing "rejects." But how did it come about?

It's the result of scientific research! Du Pont int technicians worked with illuminating en-ineers over two years. They tested many color ombinations...on many machines, in different hops, under varying lighting conditions.

One result is the color system pictured above for many metal-working machines. It consists of *DULUX Spotlight Buff* for work surfaces and *DULUX Horizon Gray* for other surfaces.

Scientifically controlled tests show that on certain types of work this color scheme aids in increasing production . . . with less fatigue, fewer accidents and improved morale for workers. This study is continuing to develop new color combinations for various machines and operations. We invite you to consult us on your particular problems.

WRITE FOR FREE BOOKLET! Gives you 24 pages with photographs in color. Traces the scientific development of the *Three Dimensional Seeing* system. Discusses the time test results and psychological reaction of workers. Shows actual color chips of *DULUX Spotlight Buff* and *Horizon Gray*. Explains this revolutionary new system. Clip coupon now. Send for *your* free copy.

HOW DULUX CAN HELP YOU—
DULUX Machinery Finish is the ideal finish for *Three Dimensional Seeing* because...it keeps original color for lifetime of service...resists softening from contact with oil and grease...dries quickly, hides solidly and resists chipping or cracking.

SEND COUPON TODAY

DU PONT
REG. U.S. PAT. OFF.

E. I. du Pont de Nemours & Co. (Inc.)
Finishes Div., Dept. F-52, Wilmington, Del.

Please see that I get booklet and complete information about *"Three Dimensional Seeing."*

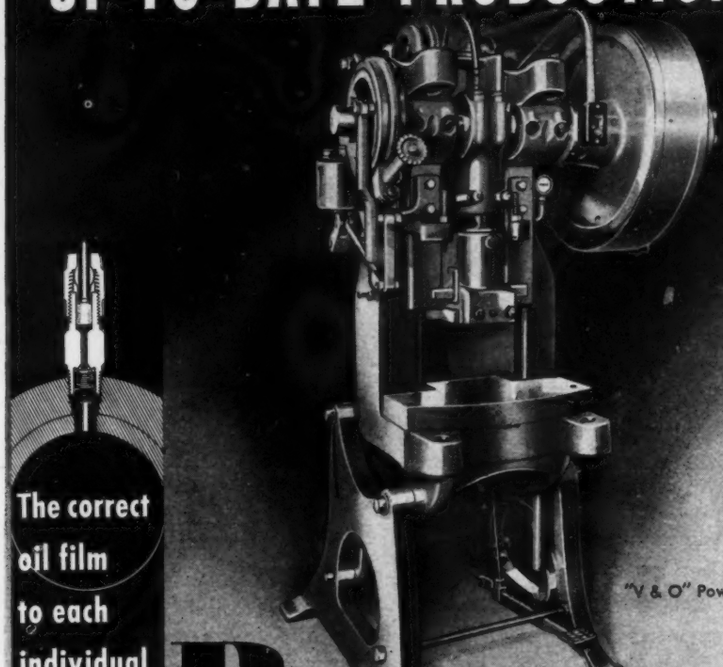
*Name*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

UP-TO-DATE PRODUCTION!



"V & O" Power Press

The correct oil film to each individual bearing... automatically

BIJUR

AUTOMATICALLY *Correct* LUBRICATION

● Bijur automatic lubrication . . . an essential development in the revolutionizing of machine tool operating efficiency . . . is now standard equipment on power presses. Heavy loads, high speeds, demand positive lubricating equipment . . . Bijur centralized, force-feed, controlled lubrication. No bearing neglected. Each fed the correct oil film required, under all operating conditions. Shut-downs avoided . . . tight production schedules upheld For low-cost maintenance, big-volume production, insist on BIJUR-EQUIPPED machines.

BIJUR LUBRICATING CORPORATION LONG ISLAND CITY NEW YORK

890

MEMO

CHECK THOSE NEW MACHINE SPECIFICATIONS. THE BEST MAKES HAVE AUTOMATIC LUBRICATION.

1558

the scene of emergency. Helmet is a laminated-bakelite Type R Skullgard protective hat, asbestos covered, and with front and rear aprons to protect the head and neck. Window of heat-resistant glass in the hood permits unobstructed vision. quick access to the suit is provided by a zipper opening extending down the front from neck to waistline. When closed, the zipper is protected by a flap held in place by two arctic buckles. Zipper fasteners at the wrist and lower sections of outside leg seams facilitate rapid entrance. Wrists, ankles, gloves, and neck portion are flannel lined for comfort. Sole and heel of boots are reinforced with asbestos brake lining material, rivefed in place. Made in a universal size only, with tabs at each side and back to adjust length. Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh.

Control Center Switchboards

Recently announced is a line of control center switchboards, consisting of an assorted assembly of switch or circuit breaker units, 30- to 200-amp. capacity, in vertical section troughs, in which power is supplied through the busbar. May be installed in one central point and immediate connection made with the load

Quietly and Unseen – ★ Thousands of CENTURY MOTORS

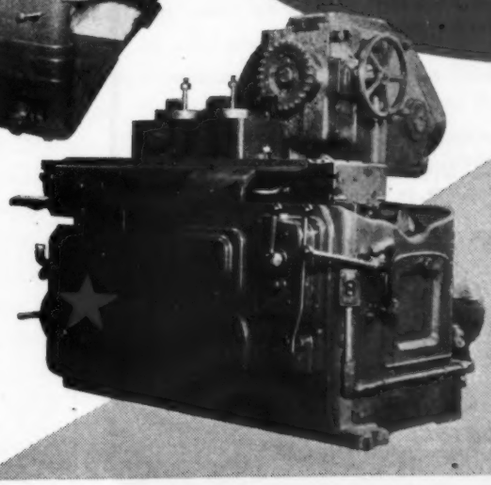
are playing their part by producing smooth power for the precision production of war needs

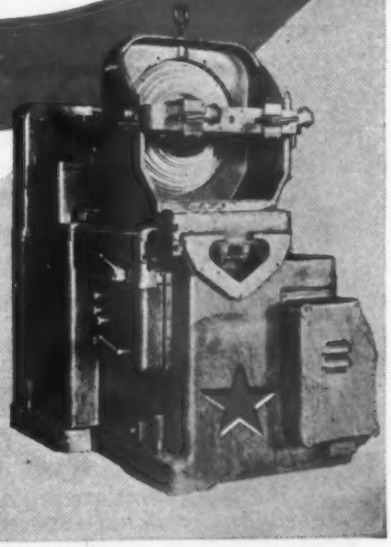
Hidden from view in the streamlined bases of thousands of the most modern machine tools, Century Motors—through their unusual freedom from vibration — are quietly contributing to more efficient production by making possible closer tolerances and consequently fewer rejects.

Built to stand the gaff of continuous, 3-shift, high speed production, Century Motors ask for no vacations or rest periods.

For a quick solution of any motor problem — get in touch with the nearest Century Motor Specialist. His wide experience in specialized motor application plus the wide range of Century sizes and types may save you time and trouble.

CENTURY ELECTRIC CO.
1806 Pine Street, St. Louis, Missouri
Offices and Stock Points in Principal Cities



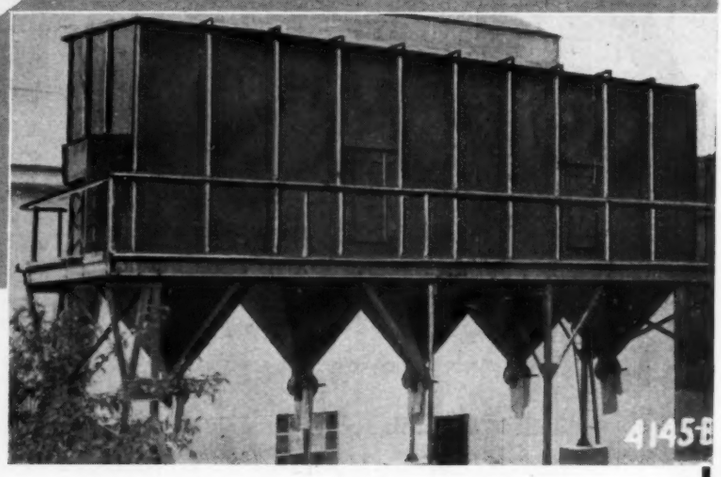


Century MOTORS

One of the Largest Exclusive Motor and Generator Manufacturers in the World.

273

SLY DUST CONTROL Ups PRODUCTION



This Sly Dust Filter installation at United Feldspar is typical of thousands of others.

IN crushing and handling feldspar (mainly for glass and ceramic industries), United Feldspar & Minerals Corp. of West Paris, Me., was faced with a serious dust hazard. Because of its powdery structure, the feldspar created excessive dust at various points of operation — crushing, screening, conveying, storage, loading, etc. *Something had to be done about it.*

They consulted us. Definite air volumes for the control of the dust were determined and a Sly Dust Control System installed. It has resulted in making the plant safe for the men and building up production.

United Feldspar has experienced in Sly Dust Filters certain exclusive advantages

1. Greater filtering capacity because of more filter cloth.
2. Less maintenance due to simpler shaker machanism.
3. Bag replacement easily handled.
4. Complete dust removal with minimum resistance to air flow because of filter bags under tension.
5. Automatic control (any degree).

This is a typical instance of Sly service. Sly Filters control over 100 different kinds of dust in over half that number of industries. Write us fully so that we may analyze your situation and tell you exactly what can be accomplished.

THE W. W. SLY MFG., CO.

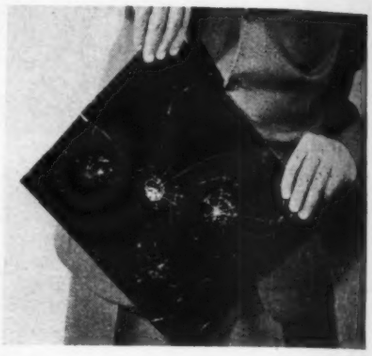
4755 Train Avenue **Cleveland, Ohio**

SLY
INDUSTRIAL DUST CONTROL

by inserting the switch or circuit breaker units (switches equipped with stabs) under the busbars in the power troughs. All interior parts are accessible from the front. The Trumbull Electric Mfg. Co., Plainville, Conn.

Window Coating

Coating known as Protex shatterproof blackout coating No. 4 has property of holding glass splinters together, even though the window may be shattered into thousands of fragments, it is claimed. Applied with a brush to the inside of

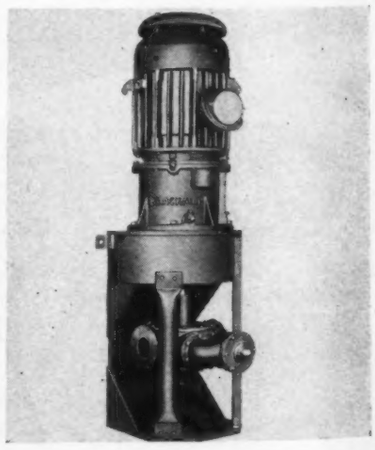


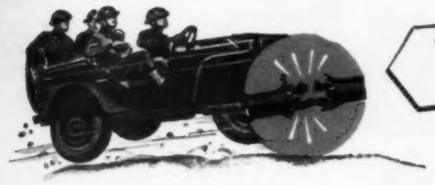
windows. Washes off easily with water and a cloth. Makes a window opaque for a year or more under normal conditions.

An outside blackout coating, known as Protex-Rowe No. 200, also is being offered. Sprayed or brushed on the outside of windows, forms a dense, flat black finish, impervious to all weather conditions. Dries in half an hour, avoids all danger of reflection, yet can be removed with kerosene and a cloth. Will not cause windows to crack or split under the heat of the sun's rays, it is claimed. Douglas Distributors, Inc., 90 Broad St., New York.

Pumps

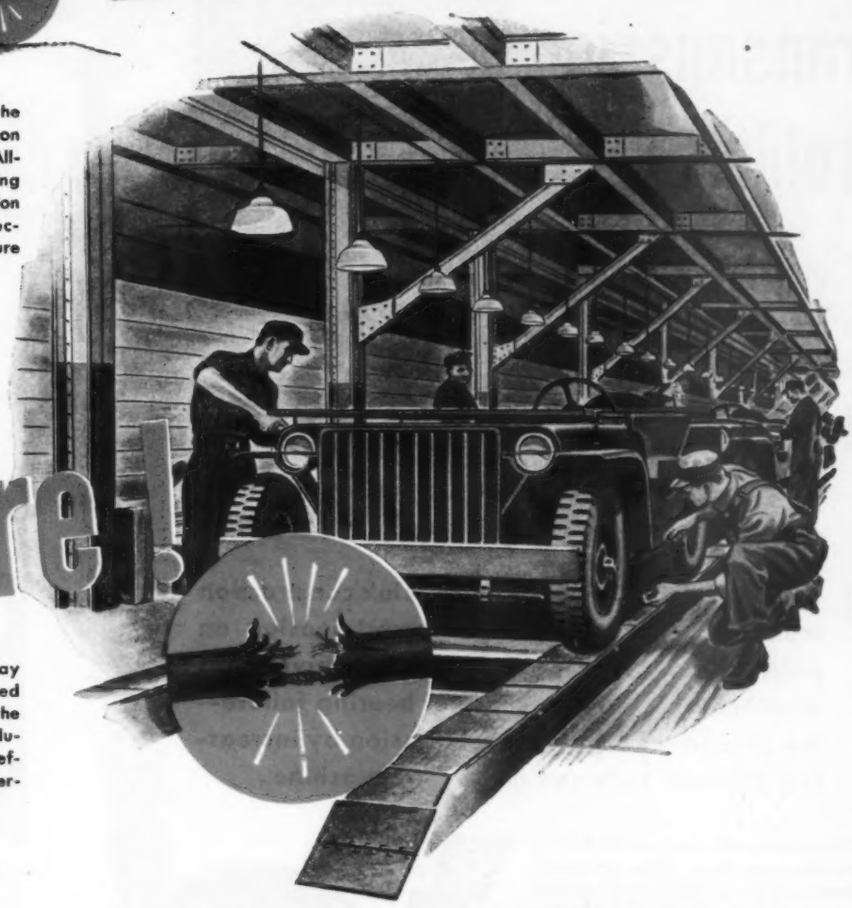
Vertically mounted rotary pump recently put into production, has a capacity of 150 g.p.m. at a pressure of 100 pounds per square inch, and is powered by a 15-hp. gearhead motor—300 r.p.m. on the pump shaft. Is also furnished in capacities from 5 to 700 g.p.m. and in pres-





They can't let it happen here!

For swift, on-the-spot maneuvering, the famous 4-wheel-drive jeeps rely on quick-starting, powerful motors. All-important to the jeep is the unfailing ignition . . . and for this vital function manufacturers put their trust in electrical cables of copper. Cable failure might be serious.



or here!

Important too, as the part they play in any single jeep, is the part played by electrical wires and cables in the plants that are producing this invaluable equipment for America's war effort. For wire failure here would interrupt production, itself.

ELECTRICAL WIRES AND CABLES OF COPPER ARE THE LIFE LINES OF OUR NATION

Today . . . Anaconda Products are pre-empted for the toughest wiring jobs in war production. Anaconda Wire & Cable Company plants are working *seven days a week*, turning out wires and cables for war needs . . . the *right* wire and the *correct* cable, engineered to fit the job.

Meanwhile . . . Anaconda Wire & Cable Research carries on: Keeping pace, the research laboratories of the Company are likewise working with redoubled effort. Here daily, is being carried out original research to improve our regular products and to develop new and better ones.

Today the benefits are going into our country's war effort. But when this war is won, Anaconda Wire & Cable Company will have collected a valuable backlog of product development and research to place at the service of industry everywhere.

42285

ANACONDA
from mine to consumer

This familiar trade-mark symbolizes the best efforts of modern research and production.

GENERAL OFFICES: 25 Broadway, New York
CHICAGO OFFICE: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Co.
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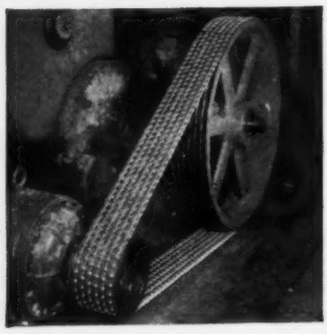
ANACONDA WIRE & CABLE COMPANY

How Veelos Solves 3 Wartime Power Transmission Problems!



1 ***VEELOS SAVES RUBBER!*** **Patented link construction gives Veelos greater flexibility although it uses less rubber per foot.**

2 ***VEELOS HELPS SPEED-UP PLANT CONVERSION!*** **Link Veelos simplifies plant layout and machine design . . . can be adapted to any length drive . . . imposes no fixed distances.**

3 ***VEELOS PROTECTS BEARINGS!*** **Link construction makes it easy to maintain correct tension on *each* strand of a multiple Veelos drive. This eliminates a common cause of bearing failure—the practice of adjusting belt tension by increasing distance between motor and machine.**

These are just a few of the Veelos advantages that offer industry real help in solving *today's* power transmission problems. Let a Veelos sales engineer—especially trained in power transmission work—tell you of many others just as important.

MANHEIM MANUFACTURING & BELTING CO., MANHEIM, PA.

VEELOS
V-BELT
ADJUSTABLE to any length
ADAPTABLE to any drive

✓ **CHECK!**

OCTOPUS FLAT TRANSMISSION BELTING saves rubber... yet has greater resilience and more powerful grip. Ends slippage and stretch.

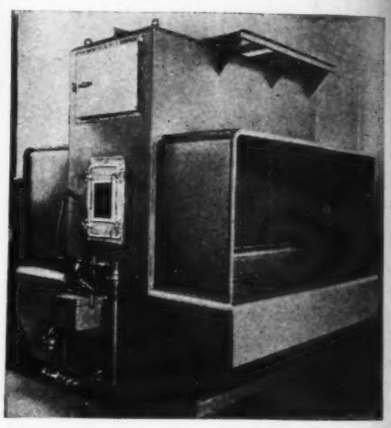
✓✓ **DOUBLE CHECK!**

Need conveyor or elevator belt fast? Your orders for* KEYSTONE CANVAS STITCHED BELTING *can be shipped in a week or less.

sures up to 300 pounds per square inch, for many industrial applications. Pump can handle a wide range of liquids, varying in viscosities from tar to naphtha. Is self-adjusting to wear. When buckets are worn out, unit may be restored to its original efficiency by replacing buckets with new ones. Blackmer Pump Co., Grand Rapids, Mich.

Dust Collector

Hydro-Foam dust collector is a completely self-contained unit, providing both bench and hood, together with adequate dust collection and ventilation. Tank forming the base of the unit is filled with water. Side extension of tank forms the bench which has for its surface a wooden grillage. Hood above grillage confines operations, and dust is drawn through grillage onto the surface of the water, directly underneath. Larger chips and coarser dust particles settle by gravity to the bottom of the tank. Air, still carrying dust, is forced downward against the water solution in



the tank forcing the bulk of the remaining dust into the water. The impinging action of this operation aerates the water solution and creates a bed of spray in the chamber above the water tank. Only the finest dust particles remain in the air currents passing up and through this spray bed. The exhaust fan and motor are mounted on the top of the unit and discharge directly into the room through a diffuser head.

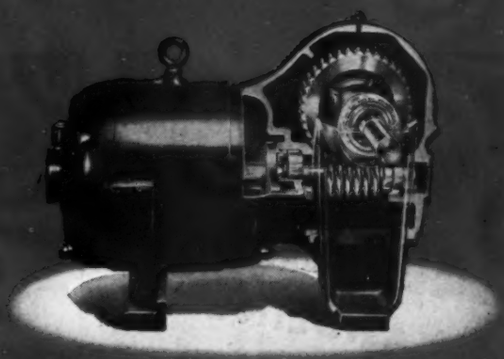
The only moving part in this Mahon Hydro-Filter Unit is the motor-driven fan, making for simplicity of operation. There are no pipes, pumps, or nozzles in the air stream.

Only one starter is necessary. Available in single or double unit. Entire unit is portable, and requires only electrical, water, and drain connections. The R. C. Mahon Company, Detroit, Mich.

Through a typographical error, this item was garbled in the March issue of FACTORY. *It is, therefore, repeated here.*

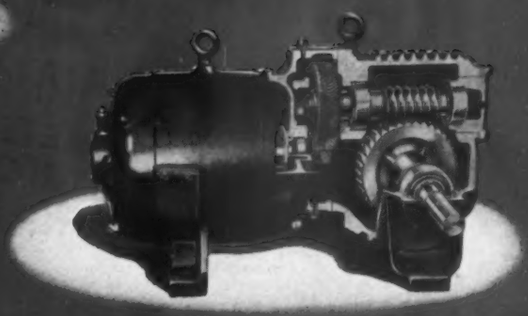
Molded Parts

Mechanical molded products, such as gaskets, diaphragms, washers, etc., made of flexible Resistoflex PVA materials cut or molded from a variety of compounded sheets can be supplied. Many of the



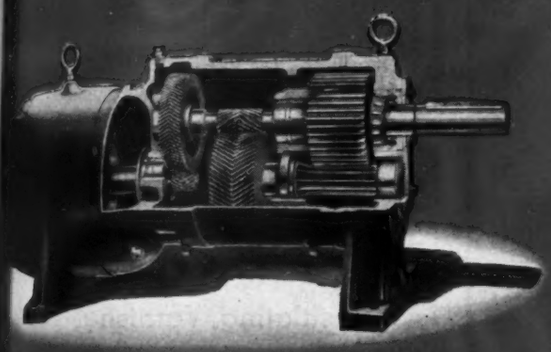
RIGHT ANGLE TYPE

RATIOS UP TO 72:1



COMBINATION TYPE

RATIOS UP TO 432:1



TRIPLE PARALLEL

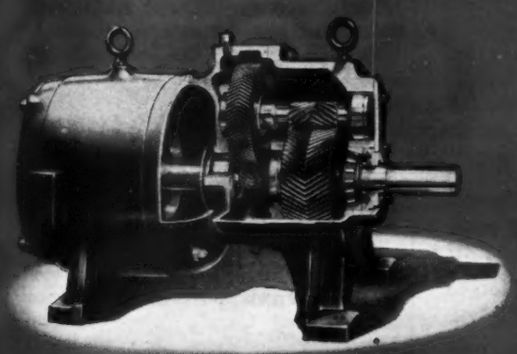
RATIOS UP TO 1296:1

MASTER

Only **MASTER** offers you a choice of FIVE different styles of Gearhead Motors from which to select a type of drive that meets exactly your individual requirements. Investigate MASTER'S unusual ability to serve you promptly and economically with motors ranging in size from 1/10 to 100 horsepower.

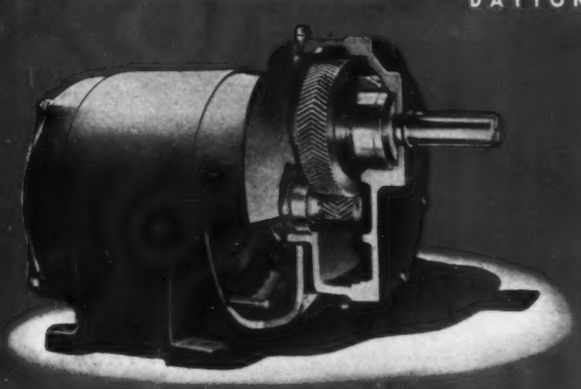
THE MASTER ELECTRIC COMPANY

DAYTON, OHIO



DOUBLE PARALLEL

RATIOS UP TO 36:1



SINGLE PARALLEL

RATIOS UP TO 6:1

The *new* CM Meteor heavy-duty wire rope electric hoist is industry's newest recruit for speeding-up production. It is designed, engineered and built to answer the nation-wide demand to produce more and faster. Featuring true balance, streamlined design . . . aeroplane type cooling . . . helical gears and one point lubrication, the CM Meteor provides fast materials handling with complete safety. Compact . . . low head room . . . readily adaptable to present systems. Only 110 volts pass through the push button station. The Meteor really *smashes* bottlenecks by speeding up materials handling.

Completely illustrated engineering Catalog No. 142 in color, showing details, specifications, applications and point by point advantages of the CM Meteor will be sent on request. Write:

CHISHOLM-MOORE HOIST CORPORATION

(Division of Columbus-McKinnon Chain Corp.)

120 FREMONT AVE. TONAWANDA, N. Y.

Branch Offices: NEW YORK • CHICAGO • CLEVELAND

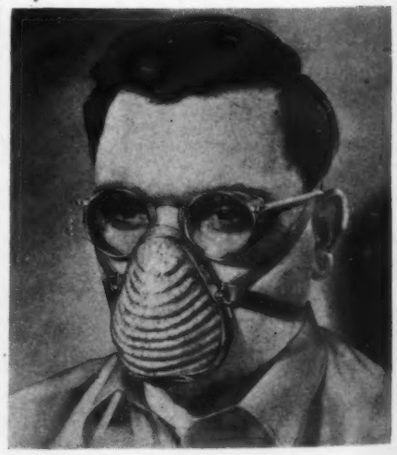
parts are made of the clear, unreinforced material, while others are made of sheets containing fabric or metal inserts or backing. All are impervious to oils and organic solvents of all kinds, and possess high tensile strength and abrasion resistance, it is claimed. Resistoflex Corp., Belleville, N. J.

Insulating Varnish

Insulating varnish, designated as S-110, for application to electrical apparatus that must operate at abnormally high temperatures, is announced. It will stand operating temperatures at 250 degrees Centigrade or higher. When baked at 175 to 200 degrees Centigrade it dries all the way through the deepest winding and does not resoften when exposed to high operating temperatures. The dried film is strong, adhesive, and flexible, and retains these characteristics under adverse heat conditions, it is claimed. The Sterling Varnish Co., 130 Ohio River Blvd., Haysville, Pa.

Respirators

Representing what is claimed to be a new design in toxic dust respirators, American R9100-T respiratory protector is light in weight and gives full vision, while the entire face piece is itself a filter and compresses maximum protection area into minimum space. Closely felted, laboratory tested filter has been approved by the



G-E

Wiring Materials Distributors

Will Help You Obtain Wiring Efficiency for Wartime Needs

H. R. Gray, salesman for the General Electric Supply Corporation, Baltimore, Md., often contacts war project customers by telephone to give them better service. Here he is giving advice on materials for special war work to a general contractor.

Dependable, easy to install conduits, cables, wires, and wiring devices are handled by all G-E Wiring Materials Distributors. One of them is located right in your own district. These Distributors are neighborly and friendly. They want to aid their customers every way they can.

A representative of your G-E Wiring Materials Distributor will be glad to help you select wiring materials for new war projects . . . for conversion of plants to war production . . . for maintenance. His knowledge of materials will enable him to help you solve wiring problems. He'll help you plan wiring, too, for plant protection with suggestions on materials for alarm systems, communication systems, light control systems.

The wide variety of materials handled by G-E Wiring Materials Distributors enables you to obtain suitable materials to meet your wartime needs efficiently.

D. B. Chandler (left), president and manager of Mid-State Electric Company, Inc., G-E Distributor, Lynchburg, Va., with A. E. Foster, stock clerk, is selecting suggested materials for wiring system in army shoe factory extension. Service is speeded by helping customers pick suitable materials for buildings needed in war effort.

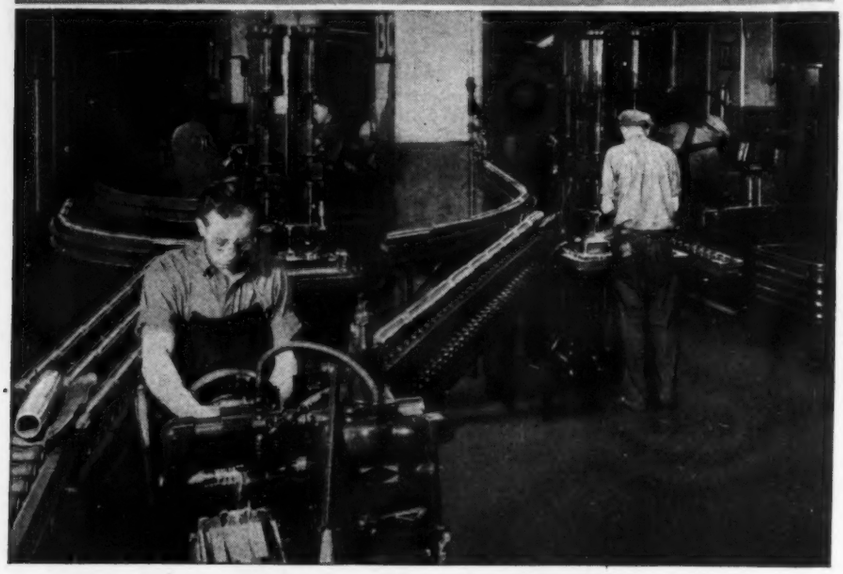
J. E. Swartz, salesman, General Electric Supply Corporation, Philadelphia, Pa., is here checking with C. Zink, truckman, on delivery of materials needed immediately for a factory engaged in essential war work. Note loading facilities with three trucks backed against platform.

G-E WIRING MATERIALS
See the nearest G-E Wiring Materials Distributor about G-E conduit, boxes and fittings, wire and cable, and wiring devices for your special requirements. Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

Walter J. Mulhall (left), salesman for the E. B. Latham Co., Newark, N. J., helps his customers select materials. Here he is discussing G-E switches for war production plants with Harry Bagwell, purchasing agent for large electrical contractor for industrials.

GENERAL ELECTRIC

STANDARD CONVEYORS ... VITAL "SUPPLY LINES" TO PRODUCTION MACHINES



CONVEYORS—planned and built by Standard—are a basic part of well organized production. They are the "arterial highways" of plant transportation—handling incoming material—work in process—keeping high-speed production machines well supplied—moving materials, parts, finished products from department to department. By cutting short handling time, eliminating repeated handling, avoiding wasteful waiting, they help to make manpower and man-hours count effectively in increased production.

Conveyorize To Meet Today's Need for Speed

Your production and handling operations can be "conveyorized" with substantial savings of space, time, and costs. Send for booklet FM-2 "Conveyors by Standard"—a useful reference book on conveying and coveyors, contains many examples of conveyor installations, shows types of conveyors best suited to various units, parts, materials, products and commodities.

STANDARD CONVEYOR COMPANY

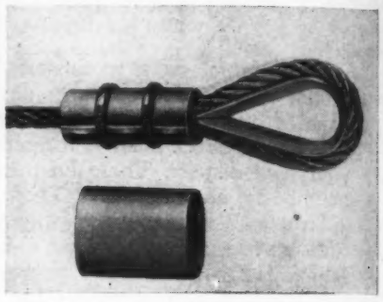
General Offices: North St. Paul, Minn.

Sales and Engineering Offices in Principal Cities

U. S. Bureau of Mines for protection against the inhalation of toxic or poisonous dusts, as lead, cadmium, arsenic, chromium, manganese, selenium, vanadium, and their compounds. Easily adjusted face piece with leak-sealing cantilever edges of pliable rubber gives face-fitting comfort. Simple non-reversing exhalation valve gives positive protection. Double headband of solid, sanitary rubber holds the respirator (which weighs 1½ ounces) in place without noticeable tension. American Optical Co., Southbridge, Mass.

Oval Splicing Sleeves

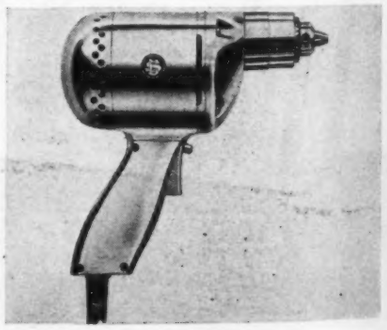
Now being manufactured are oval sleeves for splicing smaller sizes of aircraft-type wire rope up to 5/16-in. diameter. Known as Nicopress, oval sleeves are made by the same process as that used in making the sleeves used by telephone and electric light



and power companies. By this process a hard metal alloy is sprayed into the inside of the sleeves, which exerts a strong gripping power on the wire rope when the sleeve is compressed onto it. Sleeve is slipped over the ends of the rope and compressed onto them with a light, compact, hand-operated tool. The completed splice is so tight that the rope cannot pull out of the sleeve, and the strength of the splice exceeds the rated breaking strength of the wire rope. Available for splicing aircraft cord of $\frac{1}{16}$-, $\frac{1}{8}$-, $\frac{3}{32}$-, $\frac{1}{16}$-, and $\frac{5}{16}$-in. diameter. National Telephone Supply Co., 5100 Superior Ave., Chicago.

Drill

Model 14 ARD, ¼-in. heavy-duty aircraft special ball-bearing drill has recently been placed on the market. Designed primarily for operations in the aircraft industry and similar construction or production. Contains a universal motor with speeds from 750 to 5000 r.p.m.; ball bearings are set in steel retainers with screw plugs to permit easy removal; switch has locking

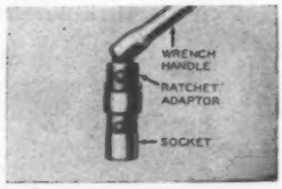


A LEFT-HANDED MONKEY WRENCH MIGHT NOT HAVE BEEN A BAD IDEA

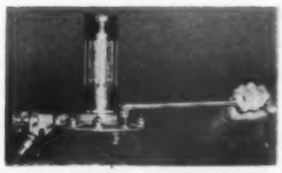
● Listen, Mister, the fellow who originated that "crack" had something. A mechanic with a big-jawed open-end or ordinary wrench has to be a regular-contortionist—the way nuts and bolts are often hidden in the darndest tight spots. Even if he can reach 'em, he can't get a firm hold, so what happens — short, time-wasting bites, rounded nut corners, slips and barked knuckles. But, that's ended now with the modern new-type, quick-detachable *Blackhawk Socket Wrenches.*

There's a *Right* Blackhawk Socket Wrench to Speed Up Every Job

Blackhawk *interchangeable* sockets, extensions, handles and ratchets give you new and startling developments for speed, safety and efficiency. They click together to make *just the right* combination for proper leverage and clearance on any assembly, service or maintenance job. Save valuable time and eliminate need for many special tools. For the last word on solving nut and bolt problems requiring wrench openings of 3/16" to 3-1/2", call your Blackhawk Industrial Supply Distributor — or write us for free copy of 48-page "HANDY GUIDE," describing the full line-up of 185 sockets, handles, attachments, box-wrenches and specialties.



New Adapter Makes a Ratchet of Any Socket Wrench Handle
A typical Blackhawk time and knuckle-saver. Fits in between socket and handle—converts any handle into a fast working ratchet. Used with tension wrenches, hinged offsets and handles, it gets you into cramped quarters, recessed spots and corners where regular ratchets can't work.



Avoid Injury and Damage from Falling Sockets
Blackhawk's exclusive, patented Thumb Release "LOCK-ON" feature makes it impossible for sockets to slip or drop off accidentally — to become lost and damage mechanism

A Product of
BLACKHAWK MFG. COMPANY
Department W2752 **Milwaukee, Wis.**

DEPENDABLE

ROPER PUMPS

Engineered to Your Requirements

The Roper line of Hydraulically Balanced Pumps offers 7548 installation possibilities giving users what practically amounts to custom-built performance at standard model prices.

EIGHT SERIES OF PUMPS

HYDRAULICALLY BALANCED

Capacities ranging from one to 1000 gallons per minute . . . pressures up to 1000 lbs. per square inch . . . speeds up to 1800 revolutions per minute . . . 21 drives and mountings . . . eight piping arrangements. From this wide variety of combinations nearly every conceivable installation requirement can be solved quickly and economically.

HANDLE ANY LIQUID

Any liquid free from abrasives can be pumped with Roper Rotary Pumps. It makes no difference how thick or how thin the liquid is, a Roper will handle your needs economically and efficiently. Whether used for general transfer or hydraulic mechanism, Roper Pumps deliver a smooth, even flow.

GET THIS VALUABLE BOOK OF PUMPING DATA

It contains complete information on the Roper line and valuable dimension and capacity tables.

ASK FOR CATALOG NO. 938

GEO. D. ROPER CORP., ROCKFORD, ILL.

ROPER *Rotary* PUMPS

pin in center of trigger permitting use by right- or left-handed operator; chuck is ¼-in., 3-jaw type; cable protector in handle; 15-ft., 3-wire cable furnished. A feature claimed for this drill is its streamlined construction, without any protuberances from end to end, and its close coupling so that it can be used in cramped quarters. Rear cap over commutator is easily removed for inspection, replacement, or adjustment. Air cooled to prevent overheating. The United States Electrical Tool Co., Cincinnati.

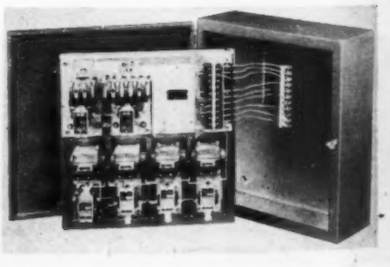
Dust Collectors

Self-contained collector units in three sizes, known as Models 30, 40, and 50, are of compact, functional design, thus require a minimum of floor space. Filtering capacities range from 275 to 1100 cu.ft. per min., with air velocities in inlet ducts up to 6000 ft. per minute. There are two standard inlets in each unit, 3 inches in

diameter on Model 30, four on Model 40, and 5 on Model 50. Inlets in special locations or of special sizes can be supplied. Motor capacity is ¼ hp. on Model 30, ½ hp. on Model 40, and 1 hp. on Model 50. Motor fan, fan housing, and electrical connections are all fitted in a removable plate, making all moving parts readily accessible for inspection. Hammond Machinery Builders, Inc. 1637 Douglas Ave., Kalamazoo, Mich.

Welder Control

Safety, simplicity, and flexibility are among the features claimed for the front resistance welder control recently introduced. Construction places all electrically energized parts behind a protective panel, thus eliminating any danger of shock while timing adjustments are being made. Calibrated timer adjustments are accessible on panel front. Design provides a separate pneumatic



MORE PLANES

MORE TANKS

MORE SHIPS

MORE GUNS

THESE vital needs of today can be built only by utilizing the productive capacity of every machine and every workman in all our industrial plants.

If you are the manufacturer of machinery who is still making his own pulleys, pillow blocks, sheaves, bearings, etc., consider the men and machines in your plant that can be put on other productive jobs by making Wood's your source for this type of equipment.

With nearly 90 years' experience behind us, our Power Transmission Equipment is serving satisfactorily in almost all lines of American industry. We can help you, let us tell you how.

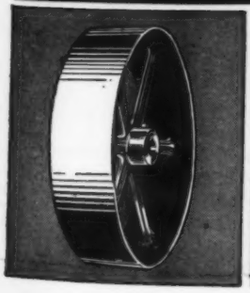
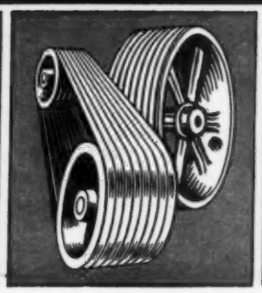
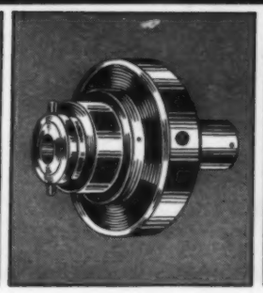
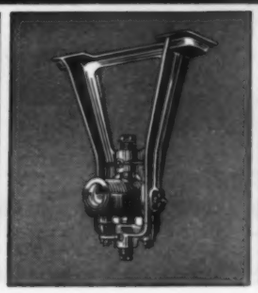
EVERYTHING IN TRANSMISSION

BEARINGS • COLLARS • CLUTCHES • COUPLINGS • CONTACTORS • HANGERS
PILLOW BLOCKS • PULLEYS • V-BELT SHEAVES AND COMPLETE V-BELT DRIVES

T. B. Wood's SONS COMPANY
CHAMBERSBURG, PA.

LONG LIFE LINE

Buy War Bonds

Keep Your Production Rollin'

Every time a piece of essential equipment is tied up for re-packing or for replacement of gaskets, Victory is delayed a little.

Let's avoid every possible interruption of our all-out production. Use *quality* packings and gaskets for long, dependable service—specify GARLOCK!

THE GARLOCK PACKING CO., PALMYRA, N. Y.

***In Canada:* The Garlock Packing Co. of Canada Ltd., Montreal, Que.**

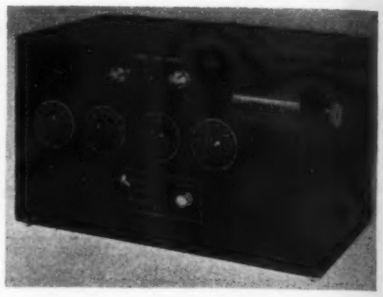
GARLOCK

Garlock *Plastallic* Packings are compounded to Garlock formulae for various services. Easy to apply. In service Plastallic combines into one homogeneous mass. Photo at right shows loose or bulk form. Below are shown coil, spiral and ring forms.

timing device for each step of the welding cycle. Timing periods from 3 to 100 cycles are obtained by turning a small knurled wheel. Interiors swing out to expose operating parts. A separable connector permits panel removal without disturbing external connections. Timers and relays can be serviced with standard tools. Eighteen NEMA standard types of weld and sequence timers, plus accessories, are available. Industrial Controller Div., Square D Co., 4041 No. Richards St., Milwaukee.

Predetermined Counter

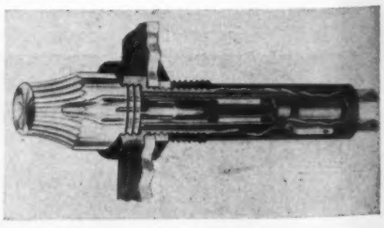
Any number from 1 to 9999 can be set up on electrically operated predetermined counters by turning knob pointers to the proper digits. When the count reaches the predetermined number thus set up, a control and signal circuit is closed (or opened). This circuit may be used to sound an alarm or operate a relay to perform any desired function.



Known as Monitor Model PDC-E, equipment is useful in counting objects passing on a conveyor or delivered from a machine. Being electrically actuated, counters may be located near to or at a distance from the things being counted. Actuated by any switch, relay, or photoelectric unit with a closed period of 0.035 second or more, and an open period of 0.040 second or more. Production Instrument Co., 700-06 W. Jackson Blvd., Chicago.

Indicator Light

Listed as Littelfuse Panel Mounting No. 1414, light goes on only when circuit is broken. Applicable to any circuits, circuit breakers, line switches, and so on. When installed at any convenient or desirable point in connection with remote motor control, it works instantly, with a plainly visible signal to show "on" or "off." When the circuit breaker opens, the light goes on .

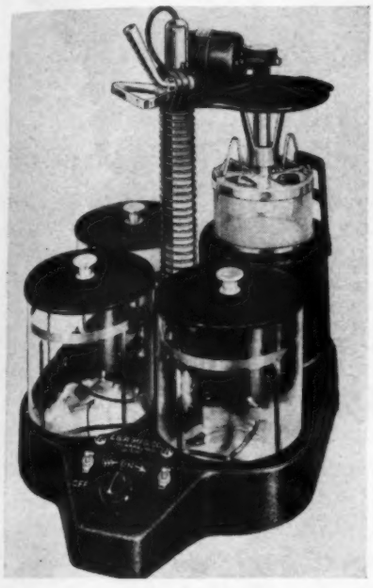


Available for 24- or 48-volt filament bulb, with which no resistor is used. Otherwise it uses a built-in 200,000-ohm protective resistor, in series with a neon lamp. The resistor prevents the lamp from blowing out on unexpected high voltages. Lamp

glows on currents as low as 100 microamperes. Made for panels up to 5/16 inch thick and ¼-in. diameter mounting hole. Over-all length, 2 inches below panel, ⅞ inch above. The rating is 90 to 250 volts. Furnished without lamp. Littelfuse, Inc., 4757 Ravenswood Ave., Chicago.

Cleaning Machines

Industrial cleaning machines, operated electrically, are especially suitable for instruments or small parts. Parts are placed in basket, which is snapped to motor shaft. Basket is then lowered into cleaning solution for a predetermined period, raised, and rotated to throw off excess cleaning fluid. Operations are then repeated in



second and third jars for rinsing. Fourth step is to place the basket over the drying chamber, which contains a separate motor and a fan. Work basket is 5½ inches wide, 3⅜ inches high. Special cleaning solutions are available in 1-gal. containers. L & R Manufacturing Co., 54-56 Clinton St., Newark, N. J.

Blackout Screens

Obscurator blackout screens can be erected on either the interior or exterior of any vertical window, and can be operated from inside or outside. When closed, give complete blackout; when open, leave 75 percent clear opening for light and ventilation with four sections of blackout screen and 80 percent with five sections. Permit unobstructed operation of sash units. Protect personnel and machinery from glass splinters and bomb fragments, and to some extent from incendiary bombs. Easily opened by ropes and pulleys, closed by gravity. Suitable for sawtooth roof lights, monitor lights, etc., with automatic release if desired. Can be fitted close to frame of window, in the space between window frame and inside or outside face of wall, on the inside or outside of wall face, to steel supports of steel sash. Finished with flat black on exterior, light gray on interior. The Obscurator Co., Madison, N. J.

SANITARY WASHING FACILITIES PREVENT DERMATITIS*—REDUCE LOST MAN-HOURS

YES 8 TO 10

Wash Simultaneously at ONE Bradley Group Washfountain

*Dermatitis — skin affection is said, by physicians, to be a serious factor in lost man-hours—and that sanitary washing is a recognized preventive

Time and space are saved by Bradleys—for 8 to 10 persons may wash simultaneously, each in his own clean running water for thorough cleansing of hands, arms, and shoulders.

Each Bradley Washfountain takes the place of 8 to 10 conventional "single-person" wash basins which means a reduction of 80 to 90 per cent in piping connections, thus saving in critical materials and in installation time.

The deep self-flushing bowls are continuously kept clear of water collection and possible contamination. They and their pedestals are constructed of precast stone and marble.

Bradleys have been the choice of leading industrial plants for many years and are used daily for the safe washing of over four million hands. Because of the greater congestion of employees today, their sanitary facilities are of more importance than ever before—to keep lost man-hours to a minimum. Our helpful Washroom Plan Booklet will be mailed on request ... BRADLEY WASHFOUNTAIN CO., 2215 W. Michigan Street, Milwaukee, Wisconsin.

BRADLEY Washfountains

Coast to Coast . . .

Finnell KEEPS 'EM ROLLING

Providing
CLEANER, SAFER FLOORS
for Workers

Stepped-up production requires stepped-up floor-cleaning schedules to remove the faster-accumulating dirt, shavings, oil, grease and other slippery substances. Interrupted service or faulty performance of floor-maintenance equipment, resulting in improperly cared for and hazardous floors, can be costly to workers, management, and the Nation.

No matter where your plant is located in the United States, there's a *Finnell* branch to see that *your* needs are promptly and correctly serviced. And *Finnell* also offers you the advantage of *a single source of supply* for *all* your floor-maintenance needs,— equipment (49 models and sizes), cleansers, finishes, and accessories.

For consultation, free floor survey, literature, or demonstration, phone nearest *Finnell* branch, or write Finnell System, Inc., 2505 East Street, Elkhart, Indiana.

Branches
IN ALL THESE CITIES:

Akron, O.
Albany, N. Y.
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Houston, Tex.
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Kansas City, Mo.
Little Rock, Ark.
Los Angeles, Calif.
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New Orleans, La.
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Portland, Ore.
Providence, R. I.
Richmond, Va.
San Francisco, Calif.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
St. Albans, W. Va.
St. Louis, Mo.
Toledo, Ohio
Tulsa, Okla.
Washington, D. C.
Wichita, Kans.
Williamsport, Pa.

FINNELL SYSTEM, INC.

Pioneers and Specialists in FLOOR MAINTENANCE EQUIPMENT

"BEATING THE PROMISE"

How production schedules can be met ahead of time... a vital contribution to industrial morale in the biggest war of men and machines that history has ever seen

HAVE you considered the importance of *sound* in "beating the promise" on production schedules?

In more and more plants throughout the country, RCA Sound Systems are proving to be an important implement to increased production.

Installed in various departments or in separate plants, the RCA Sound System serves to unify all effort. It helps add vital force—every hour of the day—to the posters, the suggestion boxes, the department competition, the entire program involved in production drives.

Messages from management . . . word from military authorities . . . can be broadcast to workers at their posts. Rallies can be staged. War news—to bring home to every man and woman what we are fighting for and how we are doing—can be piped through it.

Through its loud speakers, important orders can be issued...vital changes can be speeded to desired points...essential men summoned when needed, no matter where in the plant they may be.

During fatigue periods, music can be played to lift the spirit of workers...to relieve the tedium of monotonous work.

Truly few contributions to the staggering production problem facing this country equal in importance the RCA Sound System. It is available to industrial plants engaged in war work and is obtainable on priority by them.

If you have not yet fully acquainted yourself with this vital morale builder—and if you are now engaged in war work—communicate at once with RCA Manufacturing Company, Inc., Dept. 2-3, Camden, N. J., for complete details.

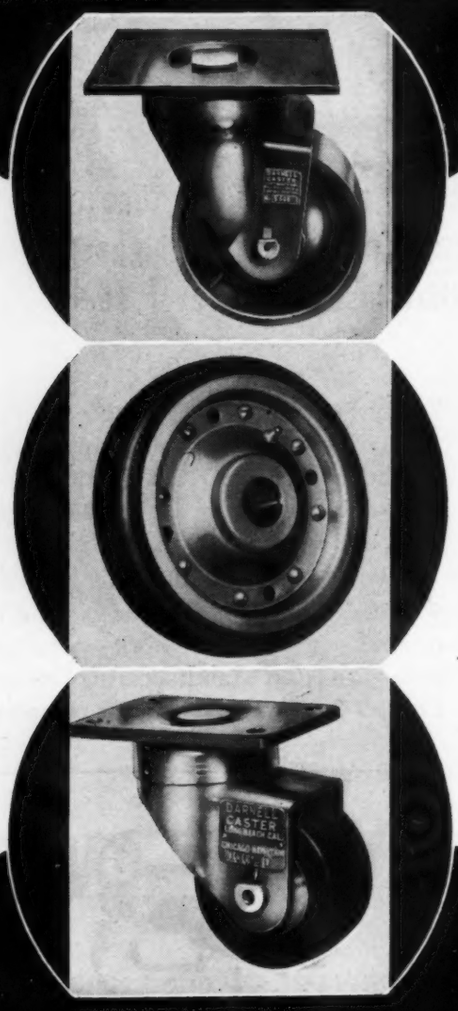
In March, "Factory Management" published an account of the RCA Manufacturing Company's worker morale building program "Beat the Promise." One of the most important reasons for the success of this program was the use of an RCA Sound System. Full information on how the sound system was used in this amazing production drive will be cheerfully explained on request.

RCA Sound Systems

MUSIC • PAGING • COMMUNICATION

A SAVING AT EVERY TURN

DARNELL CASTERS & E-Z ROLL WHEELS



- made in all sizes in both swivel and stationary types
- furnished with either semi-steel or rubber tread wheels
- assures maximum floor protection and reduces wear on equipment
- plus an appreciable increase in employee efficiency

DARNELL CORPORATION, LTD. } LONG BEACH, CALIF. 36 N. CLINTON, CHICAGO 60 WALKER ST., NEW YORK

WRITE FOR FREE DARNELL MANUAL

How to Build the Will to Win

(*Continued from page 67*)

previous articles) are being used successfully in all kinds of plants. In some cases total plant production is the measurement employed. In others, departmental quotas are set. The advice of local Army or Navy procurement officers is often helpful in choosing the method.

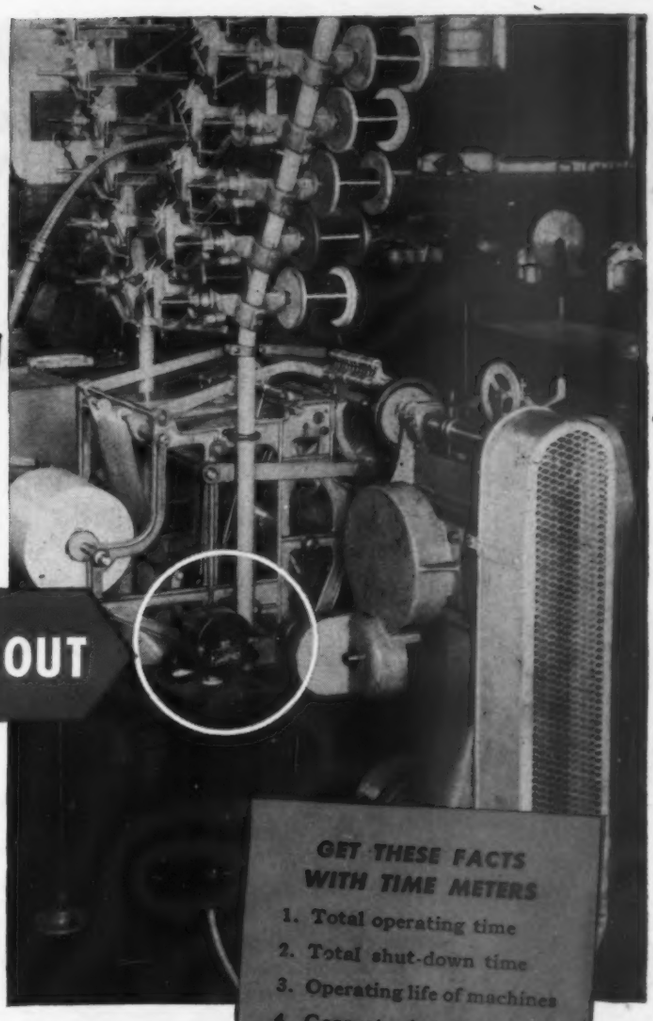
When a plant beats a promise or a department wins a contest, some sort of celebration usually follows. For example, at Buffalo Arms a manager's flag was for some time awarded regularly to the most productive department in a given period. This was delivered by a company official whose approach was heralded by a bugler. In Westinghouse's Cleveland Works, a cardboard cutout of General Douglas MacArthur stands in the contest-winning department.

Individual merit awards are now being tried. Packard Motor has named joint committees of employees and

To schedule-beating departments goes this cut-out of General MacArthur in Westinghouse "Quicker for Victory" drive

supervisors to select workers of outstanding achievement. The award is a double-wing insignia, presented with considerable ceremony. In each department of the National Acme Company of Cleveland there hangs a roll on which the employee pastes a star opposite his name for every day on

Are Any of YOUR *Machines Loafing?*



TIME METERS WILL FIND OUT

A SHOP foreman wanted to buy four new winding machines to increase production. But the delivery promise was too long. He couldn't wait—he had to step up production at once.

A G-E TIME METER SHOWED HOW

He put in a G-E time meter to check the *actual operating* time of his one coil-winding machine (shown here). The machine was found to be *operating only 13 per cent* of each shift. The rest of the time was spent in set up.

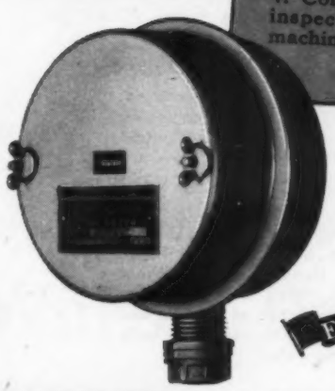
Study showed that the set-up work could be much simplified—thus increasing actual production time. New machines were not needed. This is typical of how time meters can help you get more work out of your present equipment.

THREE TYPES AVAILABLE

G-E time meters are available in panel and portable types (in addition to the conduit style shown here), and can be obtained to record operating time in hours, tenths of hours, or minutes. Their Telechron motor drive assures accurate and dependable operation.

GET THESE FACTS WITH TIME METERS

1. Total operating time
2. Total shut-down time
3. Operating life of machines
4. Correct intervals for inspecting and servicing machines



General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

IF IT'S TIME YOU WANT TO SAVE, MEASURE IT!

The story of metered time in G-E factories is available in a 16-page bulletin which gives formulas for determining: MACHINE UTILIZATION, JOB EFFICIENCY, MACHINE-CYCLE UTILIZATION. Also, it contains samples of metered-time reports and illustrations of typical time-meter installations. If you'd like a copy, use this coupon.

GENERAL ELECTRIC

General Electric, Sec. A603-24
Schenectady, N. Y.

Gentlemen:

Please send me "Metered Time," GEA-1574, and your bulletin on G-E time meters, GEA-3299.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

609-24-6500

War Times Increase Your

FIRE HAZARD!

Install

M H

VALVE
HYDRANTS
and
PIPE LINE
ACCESSORIES

Watch your factory pipe lines. Continued operation and heavy production are a strain on them. M & H products are widely used and well known for high quality material and expert workmanship. They have been used in industrial plants for many years for conveyance of water, gas, steam, oils, chemicals, and are available in all commercial sizes from 2" to 30".

M & H GATE VALVES are cast iron body, bronze mounted, with double-disc parallel seat or solid wedge top, non-rising stem or outside screw yoke. They come either with flanged or screwed connections. Valves for fire protection lines are marked "WA-FM" to denote approval of both the Underwriters and the Factory mutuals.

M & H FIRE HYDRANTS are revolving head, dry top, bronze mounted. They also are approved by "UA-FM". Entire main valve assembly is removable through barrel without digging. Special Traffic Model is fitted with breakable bolts and stem coupling, designed to break at ground line under impact. Repairs are made simply by renewing bolts and coupling without shutting off the water.

M & H PRODUCTS INCLUDE

FIRE HYDRANTS	SHEAR GATES
GATE VALVES	MUD VALVES
TAPPING VALVES	VALVE BOXES
WALL CASTINGS	FLAP VALVES
SPECIAL CASTINGS	SLUDGE SHOES
TAPPING SLEEVES	FLANGE AND FLARE FITTINGS
CHECK VALVES	FLANGED FITTINGS
FLOOR STANDS	B & S FITTINGS
EXTENSION STEMS	
CUTTING-IN TEES	

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

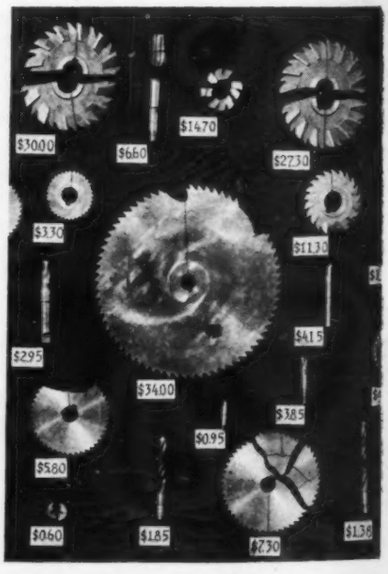
which he met his production quota. This plan has not only increased output substantially; it has materially reduced absenteeism as well.

Victory Committees

The assumption that most War Production Drive Committees are small in number and are generally headed by management men is borne out by the plans that FACTORY has had an opportunity to examine in some detail. In most cases, subcommittees are named to cover specific activities.

Eclipse Aviation, for example, has a 6-man central committee of three men each from labor and management with subcommittees of two each on scoreboard design, scoreboard location, suggestions, production, and plant efficiency, with additional 4-man subcommittees on slogans and on bulletin board notices and posters.

To give full weight to the seriousness of its purpose, the new committee at the Westinghouse Cleveland Works was launched with a formal ceremony on Sunday afternoon in the main ballroom of the Hotel Statler. Hugh Wilson, former ambassador to Germany, was the guest speaker. Fully 90 percent of the employees who were able to attend that day jammed the ballroom to pledge support to the 10-man committee in its "Quicker for Vic-



"Breakage or bullets?" That's the question posed by this novel board at Vultee Aircraft, Nashville, Tenn. Cash value of smashed tools stresses seriousness of loss

Armor...in the War of Production

Today, America is fighting on two fronts, each vital to the other. On one, it's armor of tough, thick steel backed by indomitable courage—on the other, it's the impact-resistant glass of safety goggles protecting the determined eyes of skilled workers with a vital job to do.

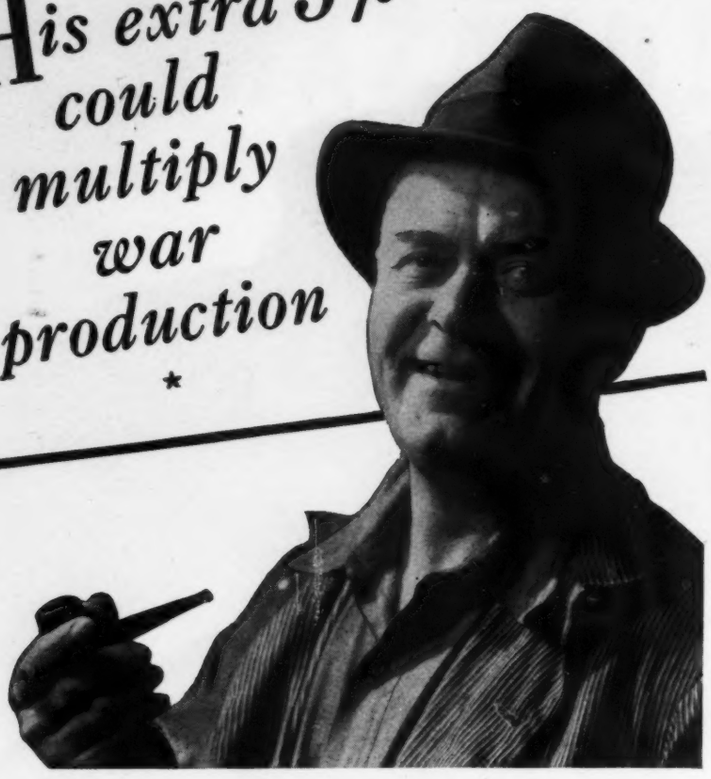
Bausch & Lomb Prescription Ground Safety Goggles Lenses, like the Bausch & Lomb optical tools of science and war, are serving their country these days.

Prescription Ground Safety Lenses afford both protection to the eyes of workers and correction that permits defective eyes to do a thoroughly efficient job. Bausch & Lomb Safety Goggles are the vital protection that stands between the eyes of the workers and the countless dangers that threaten a rapidly moving production. Bausch & Lomb Safety Goggles protect skilled workers from eye injury—workers who cannot be replaced. They guard production against the involuntary slow-down caused by defective eyesight of key workers. Bausch & Lomb Optical Co., 650 St. Paul Street, Rochester, N. Y.

BAUSCH & LOMB

Safety Goggles

His extra 3% could multiply war production



SUPPOSE better illumination could multiply the production of our six million war workers by only 3%! That alone would add 360,000,000 man-hours to America's war effort this year. It's like adding 3% more workers.

Yet, 3% is a conservative estimate of what better illumination actually does to increase production of men and machines. At the same time, it reduces spoilage and promotes greater safety.

To answer the need for higher lighting intensities in large industrial interiors, Goodrich announces the new Highlite Reflector, shown at right. It provides good diffusion, minimizes glare, softens shadows and spreads a uniform high intensity of light over a large working area.

This high-bay reflector is but one of the complete Goodrich line which includes all approved RLM fixtures as well as hundreds of sizes and styles of incandescent and fluorescent fixtures to meet every industrial need.

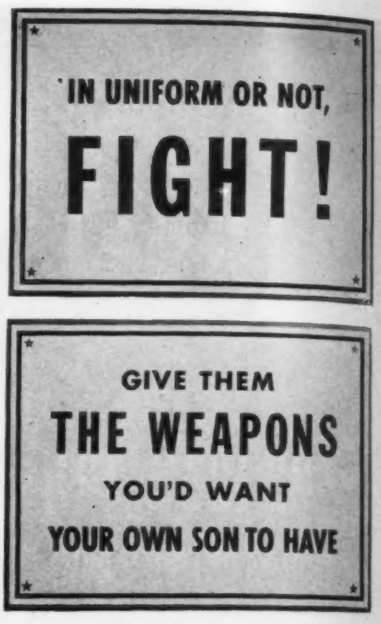
Protecting vital plants with floodlighting—saving man-hours in production — Goodrich industrial fixtures are serving America's war effort everywhere.

Goodrich Highlite Reflector

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4604 BELLE PLAINE AVENUE, CHICAGO, ILL.



Dozens of slogans on small placards stir spirit at Warner & Swasey, Cleveland, hitting the war theme from every possible "angle." Here are two good examples of W&S ingenuity. This is an idea any plant can readily adopt at small cost

tory" drive, symbolized by "Q4V." Other Westinghouse units are engaged in similar campaigns.

Ceremonies, letterheads, official names, fully drawn sets of bylaws, and systematic meeting schedules are being used to emphasize the dignity and importance of the committees and their work. Careful safeguards are being drawn into the bylaws, where they exist, or in joint statements of policy to avoid any misunderstanding of the committees' purpose and the relationship to management functions and to collective bargaining questions.

The RCA Manufacturing Company's "Victory War Production Drive Committee for Increased Production," recently formed to implement the already-active RCA "Beat the Promise" campaign, specifies these two statements, among others, in a joint announcement of policy:

"The WPB Plan is not to involve or deal with questions such as rates of pay, wages, hours, or other conditions of employment or the presentation or handling of grievances . . .

"The WPB Plan does not contemplate, nor shall it be used by labor or others for the purpose of claiming or exercising the functions of management, which shall continue in all

Production . . .

Day and night BWH is producing mechanical rubber goods. Thru our distributors many of these products reach factories running largely on defense work — as well as army cantonments, naval stations and Government flying fields.

Because of national defense requirements our stock of mechanical rubber goods may not be as complete as in normal times. Faced with emergency demands, we naturally cannot replenish our stock as promptly as formerly.

We ask our customers to bear with us and to be confident that we are trying in every conceivable way to produce their requirements as rapidly as possible.

We naturally regret losing business as much as you do . . . because volume business means ideal operating conditions . . . and because we consider our customers as our most valuable assets.

Production battles are not won by factories or machines alone. They are won by morale . . . by the courage and spirit of both workers and management to get things done. Customers' morale helps, too.

BWH

BOSTON WOVEN HOSE AND RUBBER COMPANY

WORKS: CAMBRIDGE, MASS., U. S. A. ★ P. O. BOX 1071, BOSTON, MASS., U. S. A.

★ In one of their recent bulletins on hoists, the National Safety Council says:

> *"Hooks which have become bent on account of overloading should not be straightened and put back in service, but a new hook should be provided. When a hook is once bent the stress in the metal tends to weaken it so that afterward its strength is a matter of doubt and cannot be depended upon."*

That's good advice. With the lives of American boys utterly dependent upon our industrial production, this is no time to take chances which may cause lost time accidents to men or machines, or both.

Watch the Hooks. Wright load hooks are drop-forged from special steel which, when subjected to excessive overloading, give visible warning by opening slowly. When the bottom hook has started to open, look to the top hook, too, for while it is stronger than the bottom hook, it also may be reaching a danger point.

Don't Abuse Your Hoist. Now that we are all faced with restrictions and shortages proper maintenance is of paramount importance. While every **WRIGHT HOIST** is built with load-carrying factors considerably in excess of their rated capacities, like many other well-made pieces of mechanical equipment built for specific duty, they should not be overloaded. Overloading is dangerous—to men, materials, machinery and steady production. Remember—abuse to machinery today is akin to sabotage. Conserve steel and maintain production schedules by careful use, regular inspection and proper lubrication.

WRIGHT MANUFACTURING DIVISION
YORK, PA. CHICAGO SAN FRANCISCO NEW YORK

In Business for Your Safety

TRADE MARK ACCO

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

respects as before the plan was placed in effect."

Chairman of the RCA Committee is E. J. Kelly, representing the management, with Joseph E. Mitton, president of Local 103, United Electrical, Radio, and Machine Workers of America (CIO) as vice-chairman.

An interesting case is the 12-man "Production for Victory Committee" of the Weirton Steel Company which operates under Co-Chairmen J. S. Williamson, general superintendent, and L. S. Lafferty, president of the Weirton Independent Union. The five additional management members are the heads of Weirton's five mills; the five additional union members are union leaders in the mills. A subcommittee is formed of the 97 individual stewards of the union and of the department heads throughout the mills. The central committee meets

When you get "MacArthuritis" you're ready to "Beat Their Best," and that's what they're doing at Porter-Cable Machine Company, Syracuse. Workers wear "overseas" caps

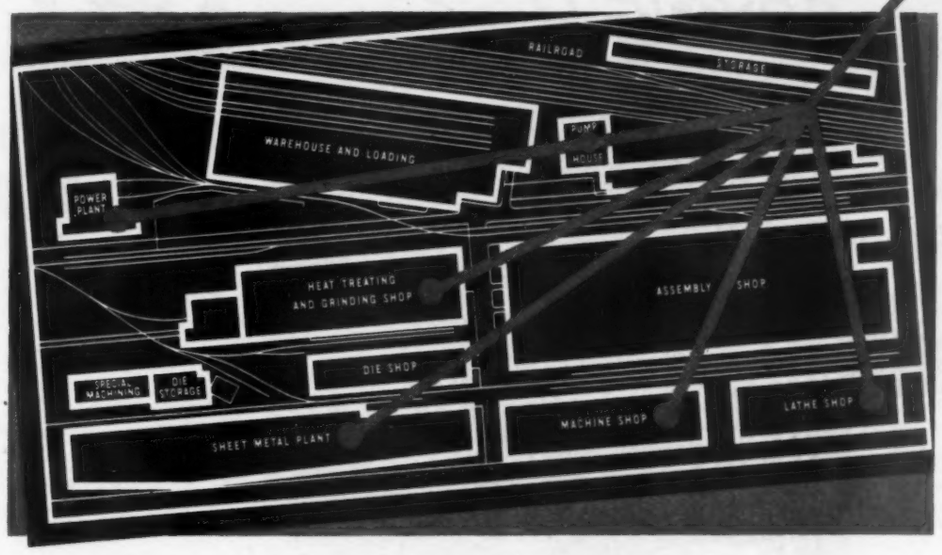
weekly but may be called into session by either co-chairman, while the subcommittee is assumed to be on the job 24 hours a day, its proposals subject to the major committee's review.

While the Victory Committee parallels the regular collective bargaining machinery of the company, "the program to speed up production is handled entirely separately from any bargaining features which may develop, and at no time does anything of a bargaining nature take place during the functioning of the Committee," the members report.

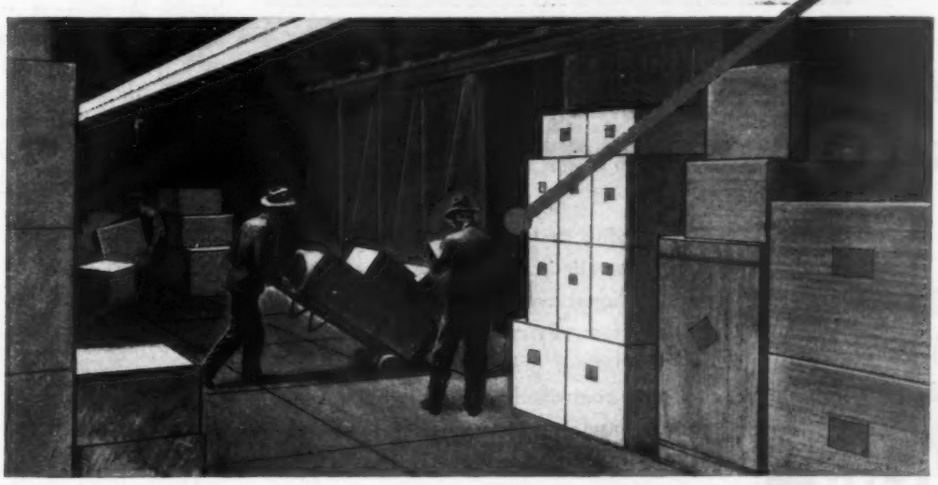
During March Weirton set a world production record for twelve open

Better Protection

with GULF QUALITY LUBRICANTS HERE



Means MORE OUTPUT HERE



YEAR in and year out, friction takes an enormous toll from American industry. In peacetime the cost of its ravages is measured only in dollars—today the cost is in war materiel critically needed by our fighting forces!

Precious hours lost in repairing breakdowns and in overhauling mechanical equipment grow quickly into "lost" planes, tanks, guns, ships, and ammunition!

Action you can take today may minimize the toll of friction in *your* plant: Make sure that each producing unit in every department is serviced with lubricants which provide an *extra margin of protection* under your particular operating conditions.

Standardize on Gulf higher quality lubricants! Years of shop performance have proved that they *stand up better* under severest operating conditions.

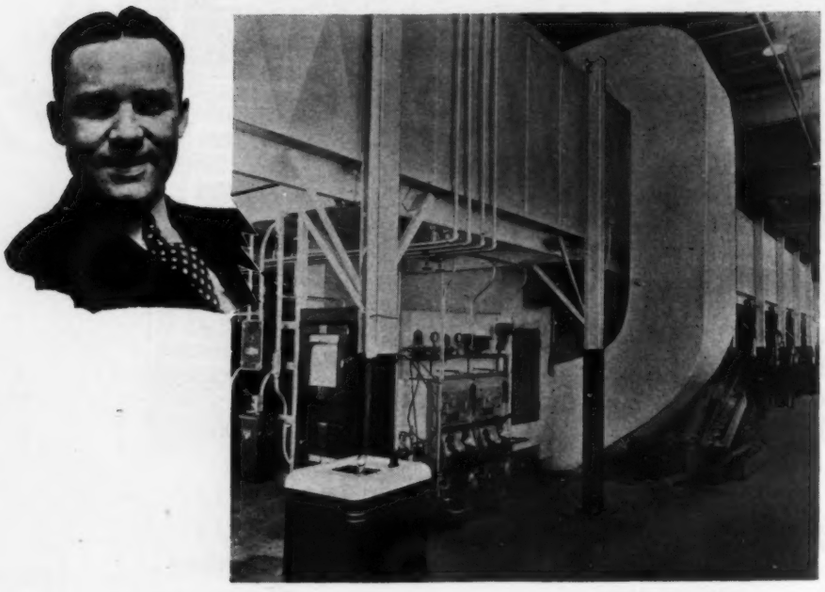
Gulf research scientists have developed oils and greases which are helping many plants set new standards of operating efficiency. By reducing wear to an absolute minimum, these better lubricants will lengthen the useful life of your machines and help you improve both quality and quantity of production.

GULF INDUSTRIAL LUBRICATION

Gulf quality lubricants are quickly available to you through more than 1200 warehouses located in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

GULF OIL CORPORATION · GULF REFINING COMPANY · GULF BUILDING · PITTSBURGH, PA.

WE HAD A PRODUCTION BOTTLENECK TOO! IT WAS *DRYING!!*



"we licked our problem —and saved money, too!"

ROSS INDUSTRIAL OVENS AND DRYERS

AIR FOR YOUR PROCESS 0° TO 1000°

"Our drying cycle was too long. We were being slowed up at our ovens. No space for additional ovens. Ross engineers solved our problem. By changing our basic method of heating, giving us higher and more uniform, controlled temperatures in a leak-proof, insulated panel oven, we have greatly reduced processing time, increased output without additional ovens—and reduced our fuel and operating costs as well."

Ross Ovens and Dryers have solved many problems like the one described above—with better quality of output, absolute safety, perfect control and greater flexibility.

Write for our Descriptive Bulletin No. 130.

J. O. ROSS ENGINEERING CORPORATION

Main Office — 350 MADISON AVE., New York, N. Y.

201 North Wells St. CHICAGO, ILL.

12363 Greeley Ave. DETROIT, MICH.

ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

"Quicker for Victory" slogan, keynote of Westinghouse Cleveland Works campaign, lends itself to an intriguing symbol

hearth furnaces, and broke additional records for processing the ingots in the company's 200 departments.

Anti-Waste Drives

At one arms factory, no apparent campaign is carried on against waste of materials and spoilage of parts. But the management bears down twice as heavily on its former method of holding frequent supervisory post-mortems over spoiled work. Today the loss is emphasized, first to the supervisors and thence to the men, in terms of its meaning to the war effort in man-hours wasted in *all* the operations that went into the processing of the part before it was spoiled.

The "Breakage or Bullets" campaign at Vultee Aircraft brings home to employees the dollar value of broken tools and stresses the fact that it takes precious *time* to replace them.

Hints and Ideas

Here, from FACTORY's notebook, are a number of novel developments recorded in production drives throughout the country.

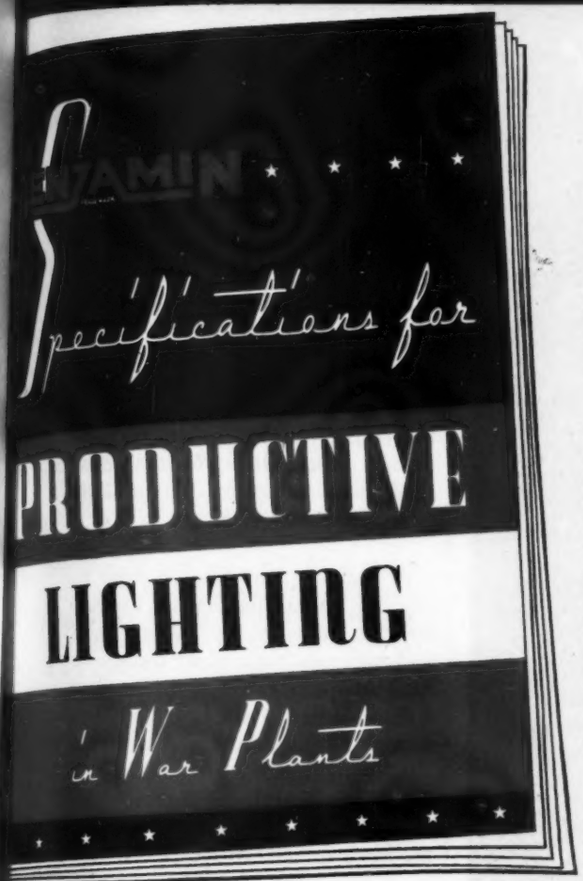
Employees at Colt's Firearms renamed the night shift the "MacArthur Shift." A new esprit sprang up, and work on the shift became more popular . . . Grumman Aircraft sends posters to schools near the plant where pupils, many of whom may become employees, can see them . . . Goodyear employees label outgoing packing cases with slogans such as "Japanese Coffins" and "O. K. America—K. O. Japan."

Employees of Spartan Aircraft, Tulsa, worked Sunday and Sunday

NOW AVAILABLE

The New War Edition Lighting Guide That Shows You

HOW TO USE LIGHTING IN YOUR WAR PRODUCTION DRIVE



Send for This Free Guide to Make Certain You Are Not Overlooking Important Lighting Factors Essential to a Smoother Flow of Increased Output.

Many are the production problems in which lighting is an important factor. For basic to all sustained and efficient production is the worker's ability to see quickly, to see accurately, and to see easily. The worker can do none of these things without good lighting.

Practical Solutions to Production Problems

This new War Edition contains complete data on how to approach, analyze and solve lighting problems. . . . How to analyze the seeing task and determine the lighting requirements. . . . Quick Reference Tables for determining the amount and kind of light required for each of the six major classifications of seeing tasks . . . also valuable data on Lighting as it relates to the problems of increased production, employee fatigue, accident reduction, greater utilization of floor space, 24 hour operation, increased prevalence of employees with deficient vision and controlled conditions plants.

Actual Usable Solutions of 21 Lighting Problems

From the many specific lighting problems submitted for solution to the Benjamin Engineering Staff, there have been selected for publication in this new book, the twenty-one problems most frequently encountered by INDUSTRY CONVERTING TO WAR PRODUCTION. The practical solutions of these problems are illustrated by means of diagrams and layouts. It is the purpose of these problem solutions to provide you with practical solutions of similar problems and to serve as guide in planning new lighting installations and relighting projects.

Authoritative . . . Factual . . . Written in Non-technical Language

This guide has been prepared to meet the pressing need for a reference book by the busy executive, plant man, and architect and all others interested in the use of lighting as a production tool. In its preparation, full use has been made of the successful experiences of the many plants using Benjamin lighting equipment as well as data from reports and publications of the Illuminating Engineering Society, RLM Standards Institute, The National Safety Council and the new "American Recommended Practice of Industrial Lighting" approved by the American Standards Association.

This Manual Brings You Up-to-Date Data on Use of Lighting as a Production Tool!

Contains pages on how to approach the lighting problem, how to analyze the seeing task, how to analyze the factors involved in proper equipment selection . . . also how to determine the proper amount of footcandles with special up-to-minute footcandle recommendation tables as guides.

Here are a few of the twenty-one problem solutions given in this Manual

- How to Provide Efficient High Level Fluorescent Lighting for Large Areas.
- Fluorescent Lighting for Areas Requiring Moderately High Intensities.
- Glassteel Diffuser General Lighting of Soft, Well Diffused, Glareless Quality.
- General Overhead Lighting for High Bay Erecting Shops, Steel Mills, Foundries.
- High Level Local Lighting over Extended Areas of Inspection or Assembly Benches.
- Local Lighting of Spray Booths.
- Protecting Material in Open Vats from Contamination in Case of Broken Lamps.
- Safe Lighting in Atmospheres Containing Highly Flammable and Explosive Vapors.
- Lighting in Locations with Deteriorating Effects of Steam Vapors and Moisture.

BENJAMIN TRADE MARK

WORLD LEADER IN INDUSTRIAL LIGHTING EQUIPMENT

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

Limited Edition! Mail this Coupon for your FREE Copy Today

BENJAMIN ELECTRIC MFG. CO., DEPT. N, DES PLAINES, ILLINOIS

Please rush to me a complimentary copy of your new Book "Specifications for Productive Lighting in War Plants."

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Company.....

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City..... State.....

NO MEASURABLE WEAR
Reported by
PROMINENT
MANUFACTURER
THEIR PROBLEM
To increase life of gears and anti-friction bearings in high speed precision tools.
THEIR SOLUTION
Addition of "Oildag" (colloidal graphite in oil) to regular greases.
THEIR RESULT
(a) Reduced temperature rise from 60°F to 45°F
(b) Current input 14% less
(c) No measurable wear on gears after 1500 hrs., nor on bearings after 300 hrs.
'Oildag' is a registered trade mark of A. C. C.
Ask for complete report of test and Bulletin No. 92 E
ACHESON COLLOIDS CORPORATION
PORT HURON, MICHIGAN
The electric furnace graphite in "dag" products is manufactured in the U. S. A.

To Industry: "Dag" Colloidal Graphite is a lubricant – resists extreme temperatures and pressures – is electrically conductive, opaque and chemically inert – can be suspended in many liquids including the lighter viscosity fluids.

night to build a plane as a gift to the Navy . . . Employees of Cannon Electric-Development, of Los Angeles, gave their pay for three shifts of Sunday work, totaling $7391, to the Navy. The management promptly matched the sum and donated the extra hundreds to make it a round $15,000 . . . At the Fairmount, W. Va., plant of Owens-Illinois, signs near the plant gate point "To Tokyo, Yokohama," and "To Defense Bonds" . . .

THREE ALLIES

Alert little figures stimulate response to doubled awards and big cash offers for suggestions during "MacArthur Month" drive at Bausch & Lomb Optical Company, Rochester, N. Y.

A Buffalo plant finds a small but effective morale-builder in the camaraderie imparted by putting men's nicknames on their plant badges. . . . At Thompson Products in Cleveland, a daytime dance was held, starting at 10 a.m. for night shift employees, with "midnight lunch" at noon . . . At Kellogg Switchboard, Chicago, a portable desk was mounted on an electric lift truck to aid two Red Cross nurses on a tour of the plant in the War Relief Drive . . . Employees of the Ferranti Electric Company, New York, raised the money for a British Spitfire in which RAF fliers had, at the last count, shot down 17 German planes . . .

A real production thriller was put on by employees of Bethlehem Steel's Quincy, Mass., shipyards who made up the slogan ""91 in 90 Days" when they set out to beat the world's record (119 days) for completion of a 12,700-ton tanker that began life as "Hull Number 1491." As work progressed, the record was plainly doomed. The men threw away the first slogan buttons—dumped them in a heap with quite a ceremony—and donned new ones which read "'91 in 76 Days!" They made it, too.

How We Go Get War Work

(Continued from page 71)

sible to the chairman for all necessary information for his department. He is responsible for keeping his senior executive head informed on major developments. The chairman reports to the head of the sales department, because it is the sales department's responsibility to obtain the inquiry, make a quotation, and follow the deal to its conclusion.

Only the four regular members have a vote, and the chairman votes to break a tie. But there also sits with the committee a second man from the production department, not a member but an assistant specially detailed to look after new equipment that may have to be obtained if we get a given contract. If we need additional machinery or outside dies, jigs, and fixtures to produce the item, he finds out whether we can get them, how soon, and what they will cost. Subject to call into committee meetings, as non-voting advisers, are representatives of the purchasing, financial, and estimating departments.

The war products committee meets daily at 1 p.m., and attendance is mandatory. Each member has an alternate, however, who takes his place when he must be absent. The sessions last anywhere from fifteen minutes to two hours and a half—this depends upon the day's volume of inquiries, and their complexity. Every inquiry is handled on the same day, since bids cannot wait. If, however, a committee member wishes to seek further information, to counsel with his department head, or otherwise to hold an inquiry open for 24 hours, he has this privilege in all except urgent cases.

A byproduct of the committee work, which may in the long run prove as valuable as the war jobs it lands, is the training of this group of junior executives in a broad, yet detailed, knowledge of the entire company. These men were, at the outset, typically departmental in their outlooks. With the passage of each week on the war products board, they become noticeably more company-minded. With practice in handling the major responsibilities of this body, they become surer and bolder. Today very few war products inquiries go up to a senior executive for consultation.

Most war products inquiries come from our salesmen in the field, and are sent on company forms which present the essential facts and figures. Some few are in preliminary form, but most of them carry blueprints so that

DELIVERIES ON TIME!

TO SPEED DEFENSE, P&H has cut delivery time on these three types of materials handling equipment from 38% to 46% in 7 months of intensive production effort. You now get faster delivery and you don't need "expediters" to get this vital equipment from P&H.

FASTER MOVEMENT of materials enables you to produce more in less time, to save manpower, to cut costs. You'll be needing this greater efficiency. Plan your production now and depend upon P&H's honest delivery promises.

Whether it's "thru the air" for long distances, or "spot handling" around machine tools, you can count on P&H Hoists to deliver quickly, smoothly, safely. *Not a late delivery in 6 months . . .* that's P&H's record, and *Honesty is still our policy.* Just ask P&H engineers to show you how you can gain this advantage, or write us direct.

General Offices: 4525 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER
CORPORATION
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

INSTALLATION
WHEELER NO. 4925 "DAY-FLO"
FLUORESCENT UNITS

WHEELER "DAY-FLO" FLUORESCENT UNITS GIVE THIS PLANT 50 FOOTCANDLES OF *"PRODUCTION BOOSTING"* DAYLIGHT ILLUMINATION

One of the surest, quickest and most economical ways to keep production levels uniform is by providing more and better light.

Good lighting is a major production tool. It enables workers to see clearly and easily at all hours — day and night. It helps eliminate accidents, eye-strain, fatigue, rejects and other factors that result in production slow-downs.

The unretouched night photograph shown above, was taken in the Assembly and Final Inspection Department of a large manufacturer. Wheeler "Day-Flo" Fluorescent Units provide an average illumination of 50 footcandles on the working plane — abundant illumination for workers to see easily at all times.

There are types and styles of Wheeler Fluorescent Units to meet practically any industrial lighting requirement. Wheeler engineers are available to assist you in recommending and planning a good lighting system.

WRITE FOR COPY OF NEW BULLETIN "WHEELER FLUORESCENT LIGHTING EQUIPMENT"

Distributed Exclusively Through Electrical Wholesalers. Manufacturers of Lighting Equipment Since 1881.

Manufacturers of Lighting Equipment Since 1881

WHEELER
REFLECTOR COMPANY
275 CONGRESS ST., BOSTON, MASS.

NEW YORK · CLEVELAND · REPRESENTATIVES IN PRINCIPAL CITIES

they can be considered in detail. If a product is obviously something we can make, something in or close to our regular line, the sales department handles it in the ordinary way without putting it up to the committee.

The committee passes upon our ability to engineer and manufacture a product, even if it involves production methods new to our company. It considers, in approximately this order, the following points:

1. *Can we make it?* Here it is necessary to go into great detail. Are new or untried processes involved, and can we handle them? Are the development and design within our range of experience? Would it require rearranging any plant departments? Will the necessary machines be free to work on this order at the time required to meet the delivery dates? In which of our plants should we plan to manufacture this job? Are the specified tolerances absolutely necessary? We get a good many inquiries accompanied by drawings which indicate that they were made by a machine designer unaccustomed to working in sheet metal, or otherwise unfamiliar with the material in which we are asked to produce the product. From time to time, of course, we find that what to our uninitiated eyes seems an unreasonably close tolerance, is actually essential to the proper functioning of the military material of which it will become a part, and we must either figure into our cost the extra dies and fixtures requisite to meet these limits, or else not bid on the job.

2. *Have we, or can we get, machines, tools, dies, fixtures to make the product?* Here the men from engineering and production have their innings. If we lack the equipment, but it would be necessary to add it for this job, everyone looks to the special assistant whose job it is to keep track of equipment available in second-hand-machinery dealers' stocks, the equipment offered in such places as the bulletins of Contract Distribution Service offices, and by private vendors. He must know the schedule of our own toolrooms, and what can probably be obtained in any given time from outside tool and die shops. If he says we can get what we need for the task, we are still interested. An important test, of course, is whether the expense of the new equipment is justified by the volume of this one contract, or whether future contracts are probable for similar products on which the same equipment could be used.

3. *Can we get the material?* Our committee members are currently fa-

Wood models today... gearmotors tomorrow

Quieter, more efficient slow-speed drives don't just happen. Improved performance is engineered—by constant, unremitting research and experiment.

Westinghouse engineers have been on this job since 1887. And today they are still working with tests and models like the ones shown above for more efficient methods of mounting, more adaptable design, and even quieter operation.

Westinghouse continues to find better answers because it attacks the problem as a whole. Westinghouse Gearmotors are designed, built and tested as complete units. Because of efficient gear-cutting processes and careful matching of motors and gears, Westinghouse is able to provide slow output speeds with efficiency as high as 98%.

Specify a Westinghouse Gearmotor for every type of slow-speed drive, whether single, double, or triple reduction or with special enclosures. For the up-to-the-minute answer to your slow-speed drive problems, see your Westinghouse representative. Or write Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Department 7-N.

J-07191-A

STANDARD A.G.M.A. OUTPUT SPEEDS

STANDARD OUTPUT SPEEDS for concentric and parallel shaft integral hp Gearmotors. Based on 1750, 1430 or 1165 rpm motor operating speeds.

1430	190	25
1170	155	20
950	125	16.5
780	100	13.5
640	84	11.0
520	68	9.0
420	56	7.5
350	45	6.0
280	37	5.0
230	30	4.0

AGMA

Westinghouse

GEARMOTORS

AMERICAN MONORAIL
EQUIPMENT

Helps Conserve Energy and Increases Efficiency

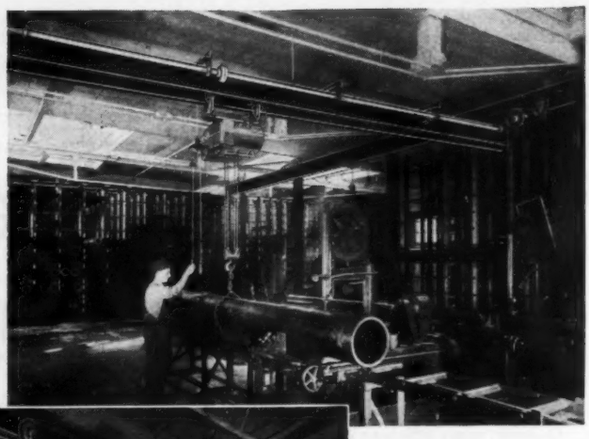
AMERICAN MONORAIL Overhead Handling Systems play a vital part in speeding up production in hundreds of plants working on war materials.

American MonoRail Equipment relieves men from lifting and carrying and enables them to give full time to production—keeps materials and products on scheduled routes, without congestion, delay and damage in transit.

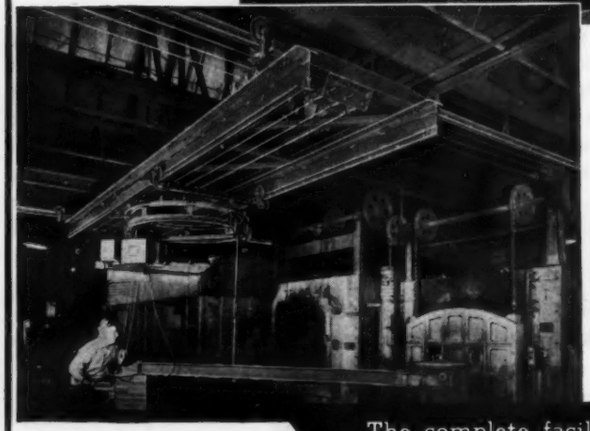
American MonoRail Equipment is engineered to meet the particular requirements of each problem. Supplied for manual, electric, or automatic operation. There is no delay or shutdown during installation. Let an American MonoRail Engineer show you how it can be done in your plant.

THE AMERICAN MONORAIL CO.
13114 ATHENS AVENUE ★ CLEVELAND, OHIO

• Easy movement of hard-to-handle loads on a simple power operated MonoRail crane.



• Special double bridge crane with swivel features for quick removal and quenching annealing pots.



WRITE FOR Blue Book illustrating hundreds of MonoRail installations.

IF YOU *Plan* TO BUILD

The complete facilities of our engineering staff are at the disposal of any company—their architects or engineers—planning to expand or construct new buildings. This service is yours for the asking.

miliar with market supplies of those materials with which we customarily work, principally sheet steel. On the less familiar materials that sometimes are included in an inquiry, the purchasing department is generally requested to send its representative into the committee meeting. If he, also, is temporarily stumped, the inquiry may be carried over to the next day's business for final report, to give him time to check the situation.

4. *If we should get this job, what shall we or can we subcontract?* Two factors usually enter here. The volume of business that we are likely to have flowing through the shop at the same time often determines whether we shall need outside aid to meet the specified delivery dates. If the job requires operations that we are not equipped or cannot become equipped to perform, we must find an outside source to subcontract these operations, or else we dare not bid. If heat-treating is specified, and thus outside the scope of our present plants, we may check to find out whether the part really needs a heat-treat, and, if so, whether perhaps we can perform the job only so far and let the purchaser do his own heat-treating.

In the earlier months of our war products activity, the percentage of inquiries on which we could bid was relatively small. But since then this percentage has increased substantially, and it is getting better all the while. The principal reason for the improvement is that our field representatives are learning to tell more accurately in advance whether a job is fitted to our manufacturing abilities, and hence are sifting out many of the obvious misfits at the source. But we are also gaining experience and versatility. We have found ways to achieve on our existing equipment results which six months ago we did not suspect were possible. And we keep adding equipment to handle specific contracts, so that we are extending our production capacity and experience.

Scheduled Production

Whatever preeminence our company achieved in costs and prompt deliveries as a manufacturer of goods for civilian use, may well be credited to our efforts to achieve mass-production economies in what was basically a job-shop type of business. A good many years ago we rearranged our entire plant layout for straight-line machine production. Next we set up what we call our scheduling plan and supplied our field force with this factory production calendar. Under this plan we divided our entire line of products into eleven groups, for sched-

100 Years of Experience

have trained us for today!

INTO America's growing war machine go a thousand vitally essential parts in which wire ensures efficient operation.

A century of progressive experience in learning how to make the finest wire and wire products for peace-time manufacture now proves its inestimable value. And even today our efforts for improvement have not been discontinued. Our scientists and research workers still labor tirelessly to discover new ways to make wire better — not only for today's needs but for the years to come.

With wire products so indispensable—with so many of the things we take for granted dependent upon wire in its various forms—isn't it important to make sure that the steel wire you use is the most reliable you can buy.

And isn't it reasonable to assume that the *safest* source of wire supply is the company that has the world's largest facilities for steel wire making, and has been at it for more than one hundred years.

American industry is accepting the fact that war needs have first call on all production. We are confident that our customers appreciate and understand the sacrifices that must be made during these times. In this all-out effort, our energies and resources are dedicated to the common task that lies before all of us.

So far as possible, we will endeavor to serve industry's needs, but—this above all—we must not forget that our very freedom is in grave danger. With courage and determination, let us all concentrate on its defense—so that we may march, hand in hand, to a victorious peace.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

Cold Finished Steel Bars · Cold Rolled Strip Steel · Stainless Steel
Manufacturers' Wires · Spring Wire · Welding Wire · Wire Springs

Wire maker to the nation ... today and tomorrow

UNITED STATES STEEL

WE HAVE BEEN DOING THIS TOO LONG

We have been hiding a light (figurative, of course) under a bushel. We mean the untiring, behind-the-scenes work of our research and design staffs who are working today on the problems of *tomorrow's* lighting. When new light sources are developed, Silv-A-King equipment will be ready to put them to the most effective use. For 21 years this policy of *looking ahead* has been a major factor in establishing Silv-A-King's reputation as lighting specialists throughout industry. Bright Light Reflector Co., Inc., 1027 Metropolitan Ave., Brooklyn, N.Y.

Write for one or both of these Silv-A-King Lighting Guides: LG1 — Fluorescent, or LG2 — Incandescent.

A Few Typical Silv-A-King Users:

AC SPARK PLUG
GENERAL MOTORS
FISHER BODY
INTERNATIONAL HARVESTER
JONES & LAUGHLIN STEEL
PITTSBURGH PLATE GLASS
and many others

SILV-A-KING MAKES *Light* WORK FOR YOU

uling purposes. All products in any one of these groups could be made on the same equipment with the same sequence of operations.

All orders for lockers, for example, on hand at 8 a. m. Monday were turned over to the factory, which started the material through the shear room on the next day's schedule. The schedule for grocery and store fixtures formerly closed on Tuesdays, for commercial shelving and for shop boxes on Wednesdays, and so on. Each schedule was planned all the way through the shop, for completion on a certain day. Any orders received after the closing of a schedule simply had to wait until the next schedule started through—which might be every other day for some of our big-volume items, and might be every two weeks for products that sold in smaller lots. The advantages of this method of operating need not be explained to any manufacturer with production-run experience.

The very nature of war products business precludes any standardization of design that would make possible such a rigid manufacturing schedule as we followed before the war. In war products we are making things to the customer's design, and to suit his convenience, not ours. Nevertheless, we have been able to achieve some of the advantages of our pre-war type of operation. For example, we try to bid on those jobs that warrant setting up our machinery economically for a production run. Any cost of tooling up for the first order of such a big-volume product can well be spread across not only the present order but also prospective orders.

The purpose, of course, is to permit us to consolidate for factory schedules assorted orders from various customers —just what we used to do with store-shelving orders from half a dozen different chains, or tote-box orders from half a dozen different industrial users. In our civilian production an individual customer's order used to lose its identity in the shop and regain its identify only on the shipping floor. So now similar war orders are being lumped together as much as possible and planned through the shop to emerge on a given day as several shipments, and they must come through on time, as a matter of course.

Manufacturing Simplicity

We engineer every war order for ourselves, make our own shop drawings, detail it, lay it out piece by piece, make our assembly drawings. This is one reason for the manufacturing simplicity we have achieved on products brand-new to us, for the lack of rejections, and for the increased

THE Automatic TRANSPORTER

ELIMINATES THIS....

GIVES YOU THIS..

with

★ FRONT WHEEL POWER DRIVE

★ CONTROLS IN STEERING HANDLE

★ SHOCKLESS HYDRAULIC PLATFORM LIFT WITH EASY FOOT CONTROL

● Think what this means in *safety* for your truckers—*lower* materials handling costs—and *increased* production efficiency.

WITHOUT STRAINING—TUGGING—PULLING OR EXTRA PUSHING, THE TRUCKER MERELY WALKS THE "TRANSPORTER" TO ELECTRICALLY MOVE A HEAVY OR BULKY LOAD WITH EASE AND SPEED.

The "TRANSPORTER" combines an efficient foot operated hydraulic lift system with electric power drive and is designed to serve all industry for economical lifting and transporting of various loads of raw materials and finished products on skid platforms up to 6000 lbs. This new lift truck is ideal for buildings where floor loads and elevators have limited capacity.

The "TRANSPORTER" is the latest development in lift trucks designed by AUTOMATIC engineers, incorporating many labor-aiding features derived from the knowledge gained through thirty-five years' experience in building Electric Industrial Power Trucks, Tractors and Cranes.

Streamlined in appearance—sturdy in construction—dependable and safe in operation, the "TRANSPORTER" is ready to operate at the trucker's command, forward or reverse, with complete brake and speed control. Just a few movements of the handle, a push of the button and away it goes at safe walking speed. Platform lift is just as easy with foot control. The platform lifts and lowers the load through shockless hydraulic action.

You will want to know more about this "TRANSPORTER"—how it operates and what it can do for you. Just fill in the coupon and mail—no obligation.

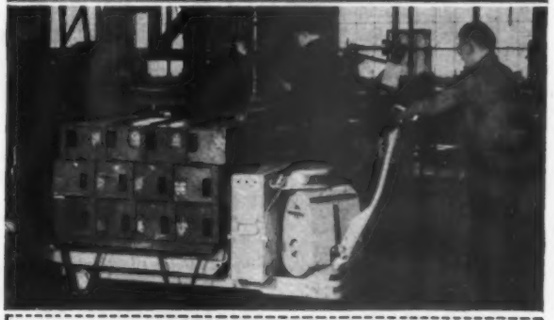
★ ★ ★

MANUFACTURERS FOR OVER 35 YEARS *Electric Propelled* INDUSTRIAL LIFT TRUCKS

AUTOMATIC TRANSPORTATION COMPANY

DIV. OF THE YALE & TOWNE MFG. CO.

39 W. 87th STREET CHICAGO, ILLINOIS



AUTOMATIC TRANSPORTATION CO.
39 WEST 87TH ST., CHICAGO, ILL.

Gentlemen: Please furnish complete information on the "TRANSPORTER" without obligation.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

"THIS SHIP WAS NEVER BUILT!"
*The billion and a half man-hours lost last year through work accidents were sufficient to build: 44 battleships, 375 destroyers, 450 submarines, 195,000 light tanks, 75,000 fighter planes or 30,000 medium bombers.
*From figures issued by official sources

HEAT-FAG is Directly Responsible for Many Accidents . . . STOP THIS COSTLY TOLL!

THE finger of Accident is always beckoning to the fatigued, inalert worker. That's why Heat-Fag, ever-present when men sweat, takes such a staggering toll in man-hours lost to industry. For, body salt lost by sweating must be replaced or Heat-Fag sets in. Lowered efficiency, fatigue and discomfort follow . . . workers become careless . . . accidents happen . . . priceless man-hours are sacrificed.

AVOID HEAT-FAG··USE **MORTON'S SALT TABLETS**

QUICK DISSOLVING (less than 30 seconds) This is how a Morton Salt Tablet looks when magnified. Examine one—see how soft and porous it is inside. When swallowed whole — with a drink of water, they dissolve in less than 30 seconds.

Wherever workers sweat, Salt Tablets are needed, for they represent the simple, easy way to replace salt that's lost through sweating and hot work.

Case of 9000 10-grain salt tablets, ... $2.60

Salt-Dextrose Tablets, case of 9000 . . . . . $3.15

Order from your distributor—or directly from this advertisement.

Place MORTON'S DISPENSERS at all Drinking Fountains They deliver salt tablets, one at a time, quickly, cleanly — without waste. Sanitary, easily filled, durable. 500-tablet size, $3.25. 1000-tablet size $4.00

MORTON SALT CO., Chicago, Ill.

FREE Sample Tube Write—on your firm letterhead — for a pocket size sample tube of Morton's Salt Tablets and for the new folder — "Heat-Fag and Accidents Ride Together."

EVERYONE WHO SWEATS NEEDS SALT

production. Part of our good luck with war products has come from going back to the customer with an alternative design for the unit to permit making it according to our standard practices.

The best example of this arose some months ago when an inquiry for one big-volume product came along. We saw that, with a few changes which appeared immaterial to its usefulness, we could make it on the special-purpose line on which we made factory stools. When this was pointed out to the government procurement body that originated the specifications, and the cost advantage was indicated, they approved our change. Incidentally, this factory-stool line was one of the nearest approaches to a single-purpose production line in our shops.

We could cite examples of revising the product instead of revising the machinery, and thus stepping up production and speeding deliveries to the armed forces and their suppliers. Usually the reason for the original design is based upon valid military considerations that an outsider could not be expected to appreciate without explanation; this is particularly true of combat equipment, most of which seems almost perfectly designed for its specialized functions. Frequently, because many sheet-metal war products go into secondary rather than combat service, our suggestion for revised design is acceptable.

A great deal of engineering is involved in redesigning products, adapting machinery to a new job, or converting existing tools to make immediately a product that could be made much more easily and cheaply if we could have time to tool up for the ideal production method. Naturally we have had to increase our engineering staff substantially in order to take care of these new problems and at the same time maintain our program of product research for post-war needs.

There have been physical as well as organizational and personnel changes involved in our war products work. We have had to buy additional machinery to accommodate war orders. Actually these additions have not been large to date, but we may have to make more extensive additions as we go all-out on war production.

Obtaining any production equipment is none too easy nowadays, of course. We maintain a list of tool and die shops in neighboring cities for possible use when our shop is overwhelmed, and one man in our production department makes contact with each of these at least every 60 days to check on their capacity to supplement our own tool and die rooms.

Change over to *Full* Machine Use and *Full* Man Hour Production

A fuse assembly plant increased its production 2½ times, with the same number of operators, by using Lamson Conveyors.

• Savings of $4,200.00 per year resulted from the installation of Lamson Dispatch Tubes in a well-known steel company's office.

WHEN you are "feeling your way" through a new war contract . . . when you're working with new materials and unfamiliar operations . . . that is when you need LAMSON CONVEYORS and LAMSON DISPATCH TUBES.

Conveyors will reduce the handling time of operators, save space, and release move-men for more important work.

Dispatch tubes reduce the time lost in walking or waiting for important papers, orders, job tickets, telegrams, office and factory forms, blueprints—even small tools.

Write or wire for specific information and our latest bulletins.

LAMSON CORPORATION, 215 LAMSON ST., SYRACUSE, N. Y.

LAMSON CONVEYORS . . . AND DISPATCH TUBES

WAR CONSTRUCTION

. . . factories, chemical and powder plants, foundries, storage sheds, boiler-houses, pump-houses, hangars, etc.

Write for Literature and Sample

Get complete information on APS and ask for free sample. We'll gladly send you informative folder, as well as our Special Engineer's Handbook with constructional details and useful data for estimating. Name of nearest representative sent on request.

★SPEED

Requires no field coat, eliminating costly delays.

Available in standard stock sizes NOW.

Special sizes can be quickly processed and shipped.

★ECONOMY

Reasonably low prime cost.

No painting or maintenance expense.

Easily and economically erected.

★DURABILITY

Molten plastic compound uniformly applied by special roller-coating process. Further reinforcement with inert mineral substance assures maximum protection.

Scientifically controlled heat process assures perfect bond of metal and protective coat.

Every sheet coated flat, then formed—an indication of its rugged quality.

Durable in the extreme range of weather conditions—resistant to acid fumes and gases!

LEVINSON STEEL SALES CO.

National Distributors for A P S Roofing and Siding

33 PRIDE STREET · PITTSBURGH, PA.

We have a national list of dealers in used machinery. We send letters of inquiry to the more promising of these firms when we need a new machine. Our salesmen call upon many of these dealers regularly and notify our home office of any machinery on their floors that seems fitted to our processes. Also, our production department checks used-machinery want ads from the principal industrial cities, subscribes to news clipping services, and, whenever a particularly desirable machine is located, takes a trip to the site to examine it.

In the stress of war requirements we are also forced to call upon some of our machines to perform duties heavier than they were designed for. Here, for instance, comes a contract that must be delivered even sooner than the usual tight schedule on war orders. To produce this on our machinery, strictly observing the maker's ratings of capacity, would be impossible. So our people design the job for production on what we possess. They may have to put 10-gage steel on a machine supposedly capable of handling 12-gage or lighter. In the long run, overloading may increase our maintenance costs, but meanwhile the armed forces are getting our production not behind schedule but right now, in Donald Nelson's ten silver months. Our plant executives say that their respect for American machine designers has increased many fold since we got into war production and began crowding the rated capacities of the machines.

In figuring prices on war products, we keep in mind several elements that may enter into the costs. Special products usually require increased supervision. Speeding production to meet a hurry-up delivery date increases labor costs. Rearranging production lines, equipping with special tools, and so forth, add to the cost, although the possibility of spreading these original costs over future business of similar nature always deserves consideration. Increasing volume to the absolute capacity of the shop may boost indirect labor cost. Special crating and packing, sometimes overlooked, are an added factor of expense. Pilot shipments, sometimes required, are so costly that they should not be ignored. Finally, there is always the possibility that labor and material costs may increase during the life of the contract.

At least in the sheet-metal industry, prices obtainable on war products tend to be extremely low, barely above the cost of direct labor and material. An idea of the intense competition may be obtained from the number of bidders, which on one of our jobs was

MAHON *Built-for-the-Job* FINISHING EQUIPMENT

PUTS FINISHING OPERATIONS ON A *FAST*, PROFITABLE BASIS

This Mahon Oven—for the curing of rubber—was designed, built and installed by Mahon engineers. Every detail of its construction—from controls to interior conveyor equipment—was planned and built-for-the-job. Six months continuous operation has completely proved its efficiency and economy.

The greatly accelerated production schedules industry must meet today is putting a tremendous strain on production facilities. Outmoded and inadequate equipment cannot cope with this overload without the occurrence of serious delays and tie-ups. This is particularly true in FINISHING operations.

In practically every industry where FINISHING assumes a major factor in the production of war essentials, Mahon *built-for-the-job* Finishing Equipment plays an important role. Through constant research and development, Mahon engineers have kept abreast of industry's demands for more efficient equipment and more economical methods.

Today, the Mahon engineering staff, armed with years of experience, stands ready to serve you . . . no matter what your requirements may be . . . a Complete Finishing System or an individual unit thereof. These finishing experts will make a survey of your plant and, by actual tests on Mahon Finishing Equipment now in operation, will show you to what extent your production may be speeded up. Consultation places you under no obligation.

Manufacturers of

Metal Cleaning Machines, Rust Proofing Machines, Hydro-Filter Spray Booths, Ovens of All Types, Filtered Air Supply Units, Hydro-Foam Dust Collectors—and Many Other Units of Special Production Equipment—including Complete Finishing Systems.

THE R. C. MAHON COMPANY • DETROIT • CHICAGO

MAHON

Prime movers

FOR AMERICAN WAR PRODUCTION

● The great units of America's transportation system, her trucks and trains, depend heavily upon another transportation system to keep them rolling — the modern conveyer system. Without conveying equipment to speed materials to and from processing machinery, and into the cars and holds of ships, the transportation of vital war material would slow down considerably. Ships would remain longer in port — carloadings would fall off.

Long Mathews engineering hours are devoted entirely these days to the development of equipment for handling war material so that our prime movers can get it to where it is needed in less time.

MATHEWS CONVEYER CO.
ELLWOOD CITY, PA.

If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION

235. It is therefore apparent that, even though we succeed in keeping our plants working to their capacity, the rate of profit will hardly be anything to cheer about. However, this does not discourage us. After all, our job for the duration must be to contribute to the cause of our country the best that we can give.

How We Doubled Production

(*Continued from page 88*)

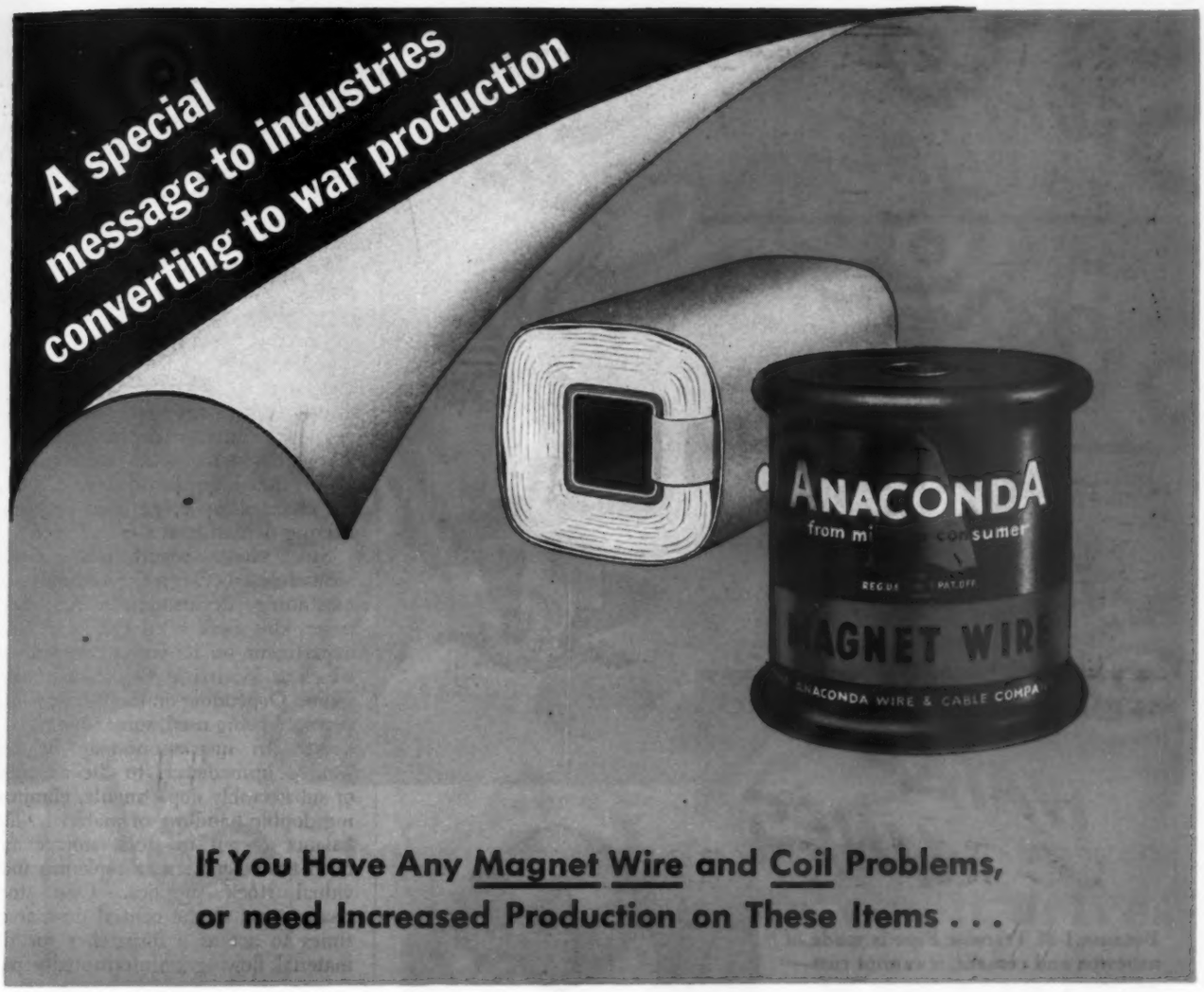
amounts, estimated on the basis of the prevailing rate of production and, consequently, the rate of consumption.

The form shown in Figure 7, made out in triplicate on green, brown, and yellow paper, is used only for ordering castings. Fixed quantities are ordered at one time, sufficient to supply operations in the working areas for a predetermined period. Generally, enough big gray iron castings are ordered to keep one week's supply in rough storage outside the plant. Where steel castings are concerned, the maximum number of small parts ordered seldom exceeds 90 days' supply. Here, too, several sources of supply are regularly used (see FACTORY, April, 1942, page 52). The green card goes to the vendor. Although small, 5 x 3 inches, in actual use this card has been found entirely satisfactory. The brown card is kept with the bin or trays of parts as delivered, and is filed only after *all* the order has been filled. The yellow card is attached to the blueprint of manufacturing operations after delivery of parts is completed. With the routing card, it accompanies parts through processing and to stock storage.

For ordering steel, forgings, or bar stock from stock for a manufacturing department, the form shown in Figure 8 is used. A Routing Card (not shown) accompanies this form to specify delivery destination in the plant.

The yellow "Arrow Card" (Figure 9), so-called because of the arrow stamped on the back as an "expediting" sign, is used sparingly to move parts out of routine handling and rush them through manufacturing. Work coming to a department with this arrow card attached, takes precedence over anything and everything in that department. If it is necessary to do so, other work must be taken out of a machine and a new set-up made to take care of work on the rush parts.

A Shortage Card (Figure 10), is used for withdrawal from stock of parts not standard. This card is turned over by the engineering department to the stock records department. Items that


A special message to industries converting to war production
ANACONDA
from mi consumer
REG U.S. PAT. OFF.
AGNET WIR
ANACONDA WIRE & CABLE COMPA

If You Have Any Magnet Wire and Coil Problems, or need Increased Production on These Items . . .

Anaconda Can Help!...

Anaconda's Central West plants still have unfilled capacity on magnet wire and coil production . . . *for war work*. In addition to these facilities, they have experienced personnel to help solve problems you might have with this phase of manufacture.

Here is an opportunity to release your time so that it can be devoted to other important problems. Our sales offices, located in all principal cities, are near you. Call today. A representative will be glad to discuss your problem.

GENERAL OFFICES: 25 Broadway, New York City
CHICAGO OFFICE: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Company
Sales Offices in Principal Cities

ANACONDA
from mine to consumer
This familiar trade-mark symbolizes the best efforts of modern research and production.

These Improved Insulations Are Now Available

Nylon — Vitrotex — and Formvar

The commercial development of Nylon and Vitrotex insulations is in part the result of Anaconda research . . . research that continues with redoubled effort producing new products for war work. Of course, when peace comes, the benefits of this research will be ready for industry everywhere.

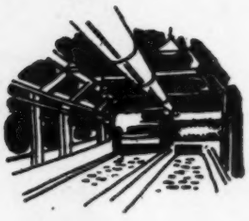
42362

Magnet wire and coils

ANACONDA WIRE & CABLE COMPANY

FOR SUPPLY LINES

FOR PROCESS LINES



FOR FIRE LINES

FOR CONDENSER WATER LINES

Because J-M Transite Pipe is made of asbestos and cement, it cannot rust—will never cause troublesome "red water." Its smooth interior provides unusually high delivery capacity that can never be reduced by tuberculation—the internal corrosion that cuts down the rate of flow in ordinary pipe. Joints in Transite lines stay tight in service. And, because of its long lengths and relatively light weight, Transite is easy to handle and assemble.

For details write for brochure TR-11A. Johns-Manville, 22 East 40th Street, New York, N. Y.

JM Johns-Manville

TRANSITE PIPE

AN ASBESTOS PRODUCT

For efficient, economical industrial water lines

can be supplied only in part are so indicated under "shortage column." Shortage information is transferred to a large card (not shown) for daily follow-up by a stock chaser. This sheet is simply a memorandum for the guidance of the stock chasers.

Three departments report to the head of production control—the receiving department, the order and stock records department, and stock storage. Stock chasers and the pattern department report to the order and stock record department. We have found that having the pattern department report to the order and stock record department makes it easier to expedite changes with the least delay. They are now frequently accomplished almost before finished drawings noting the changes can come from the engineering department.

Stock chasers report to a centrally located desk between the assembly and machining departments. All work passes this desk from the machining department on its way to inspection, which is located at the stock storage room. Depending on the rate at which parts are being used, some material delivered to inspection may be forwarded immediately to the assembly or subassembly departments, eliminating double handling of material. The balance is put in stock storage and from there sent out to replenish individual stock supplies. One stock chaser stays at the central desk at all times to act as a dispatcher for the material flowing uninterruptedly past this point. On the day shift two stock chasers circulate all the time through the assembly and subassembly departments. On the night shift a single stock chaser is used for this purpose. The rest of the stock chasers follow definite assignments throughout the plant, always with a view to keeping production going at top speed.

Individual Duties Simplified

The simplification of individual duties has also been applied to our stock storage department, which has been divided into four sections with one man and one or more assistants in charge of each section. With only a quarter of the total stock to become acquainted with, these men can do a much better job.

Many of the things that we have been able to do in the way of expediting production at Monarch have been made possible, of course, by the volume of orders and the uninterrupted flow of work. However, by the same token, no system of getting the work out could have had a more thoroughgoing trial, under more urgent conditions, than at present.

We feel that no hard-and-fast dis-

MULTIPLE V-BELT DRIVE ASS'N

THE DOMINANT DRIVE OF INDUSTRY

TRADE MARK

The use of this emblem by an association member in connection with Multiple V-Belt Drives is your assurance of mechanical excellence — the result of cooperative engineering, research and experience.

horsepower to elephant power .... with multiple v-belt drives

The first commercial Multiple V-Belt Drive, rated at 10 h.p. was put into service early in 1925 and used to drive a cotton twister frame. Encouraged by the success of its operation, larger drives were tried, and, when they likewise proved eminently satisfactory, still larger installations were made. . . . In practically every type of service, it was demonstrated that a Multiple V-Belt Drive would do the job better and more economically. Today, there are Multiple V-Belt Drives delivering 2000 horsepower. And tomorrow? Who can say? Apparently, there is no ceiling beyond that of demand. . . . It is obvious that this popular method of power transmission had to be outstandingly better to become "The Dominant Drive of Industry". And it is likewise obvious, that only by free interchange of engineering research and field findings between members of the Multiple V-Belt Drive Association, that such amazingly swift progress could have been made.

MULTIPLE-V-BELT DRIVE ASSOCIATION
140 SOUTH DEARBORN STREET • CHICAGO

A TYPICAL, RAPID, DEPENDABLE AND SATISFACTORY INDUSTRIAL BUILDING JOB *by*

PITTSBURGH ·DES MOINES

HOUSING all the activities of a moderate-size manufacturing plant, including shops, office, locker rooms and washrooms, this economically-designed, fireproof building meets the specific requirements of the owner.

After client-consultations on site, size and space needs, P.DM designed and built the plant complete—in minimum time, with the maximum economy permitted by sound engineering practice—providing entire freedom of detail for the purchaser, under a single responsible contract.

Let us estimate on your own building requirements.

PITTSBURGH-DES MOINES STEEL CO.

PITTSBURGH, PA. 3458 NEVILLE ISLAND—DES MOINES, IA. 959 TUTTLE ST.

NEW YORK, ROOM 944, 270 BROADWAY . . . CHICAGO, 1262 FIRST NATIONAL BANK BUILDING
DALLAS, 1263 PRAETORIAN BUILDING . . . SAN FRANCISCO, 665 RIALTO BUILDING
SEATTLE, 1166 EIGHTH AVE., SOUTH

tribution or division of credit can properly be given to any single one of the four approaches we have made to the over-all problem of securing increased production without a comparable increase in manufacturing area. Certainly it must be admitted that the standardization of many parts, which we had commenced as early as 1929, contributes materially when, as at the present time, we are called upon to increase the production of certain types of lathes. We have been fortunate, too, in that the expansion we have been able to make has been of such a nature as to fill out and supplement existing plant structure and facilities, rather than to embark on a wholly separate plant. This has made it possible to bring to even greater refinement our grouping of related operations, thereby reducing to a minimum the amount of "buggy-riding" of parts that otherwise might be necessary to carry work from one job to the next.

Our program of work simplification had its greatest test two years ago when it became necessary to add some 500 men to our working force. Although we used 60 men who had been with the company five years or more as subforemen or group leaders to instruct the new men, the greatest aid to getting the new men into production as promptly as possible must be credited largely to two things: (1) The extent to which individual operations had been broken down and responsibilities simplified; and (2) the degree to which it was possible for us to substitute good tooling and machine controls for the skill which only time could bring to the new employees.

Finally, the thing that has kept our expanded production program functioning at maximum effectiveness has been the successful application of a production control system which, with a minimum of paperwork, keeps a relatively small inventory turning over at a speed carefully coordinated with production requirements.

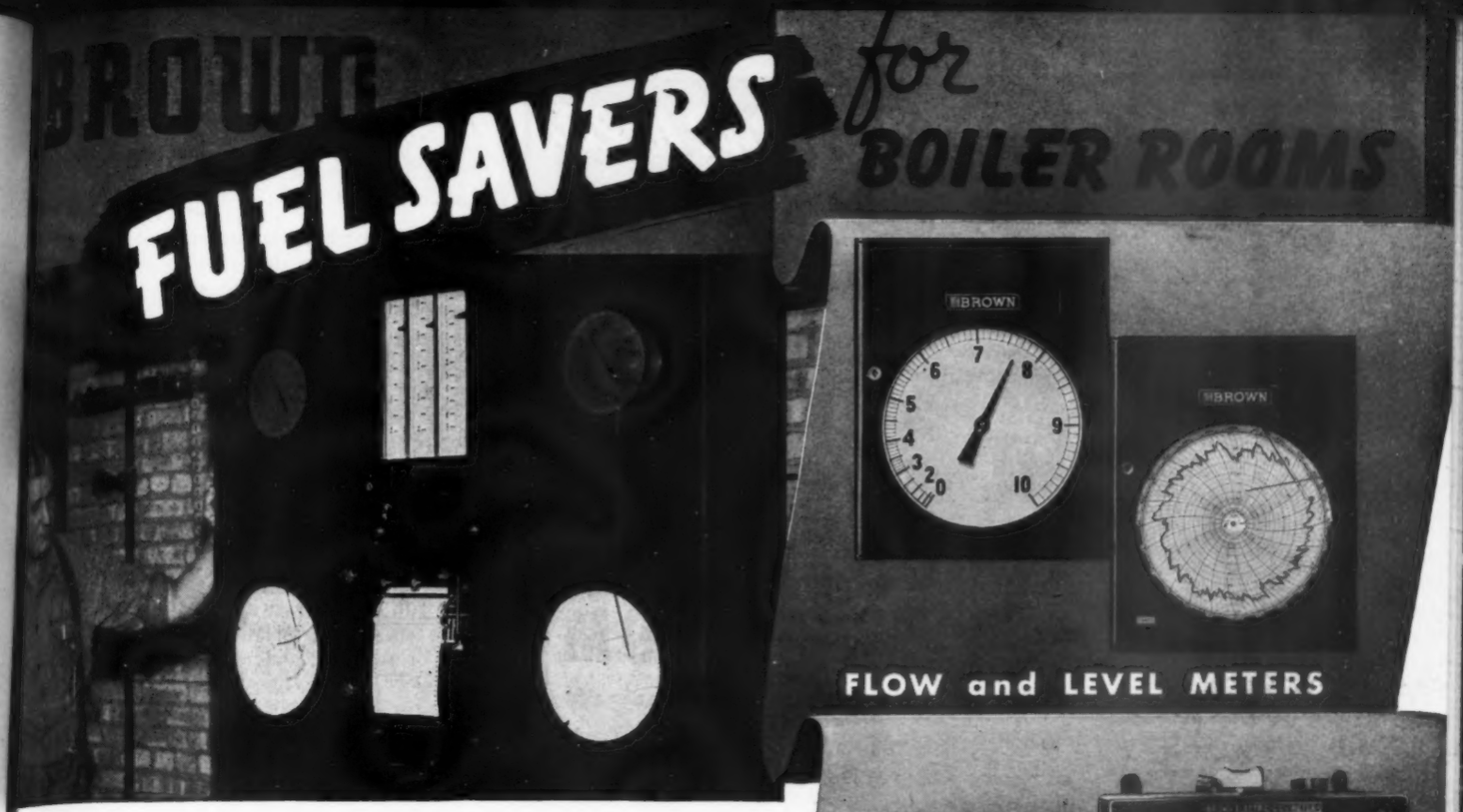
Significant Labor Developments

(*Continued from page 89*)

between union and employer under which wage changes can be made only by mutual consent. (Postal Telegraph and Cable Company.)

Where a contract affecting a metropolitan transportation system permitted adjustment, however, the WLB intervened to increase rates by 5 cents an hour. However, upon the petition of either party, the Board may make a final upward or downward adjust-

BROWN FUEL SAVERS for BOILER ROOMS



IF you use steam for power, heating or processing—do you know how much steam is generated for every dollar expended for fuel? Are your boilers operating at their highest efficiency? How economically is steam being used?

To get the answers to these questions it is essential to measure temperatures, pressures, flows, $\%CO_2$ and liquid levels.

Whether you burn oil, gas or coal, Brown Indicating and Recording Instruments furnish the essential information to operators and engineers to enable them to reduce fuel costs. For example:

BROWN FLOW METERS . . . tell how much steam is generated by each boiler; the amount of water fed to the boilers, and the rate and quantity of blow-down.

BROWN CO_2 METERS . . . when used as a firing guide, enable operators to hold the correct per cent CO_2 and prevent fuel losses due to improper air-fuel ratios.

BROWN THERMOMETERS AND PYROMETERS . . . are essential guides in checking Flue Gas, Feed Water, Economizer and Superheater temperatures. They are vital factors in overall operating efficiency.

BROWN PRESSURE GAUGES . . . aid in maintaining steam pressures, not only in the boiler, but also in each department.

Our engineers will be glad to recommend the instruments that will most economically meet your boiler room or plant requirements. Write for information.

For Temperatures . . . . . Pressures . . . . . Flows . . . . . Liquid Levels

BROWN INSTRUMENTS

ELECTRIC • AIR OPERATED

THE BROWN INSTRUMENT COMPANY, 4461 WAYNE AVENUE, PHILADELPHIA, PENNSYLVANIA

DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.

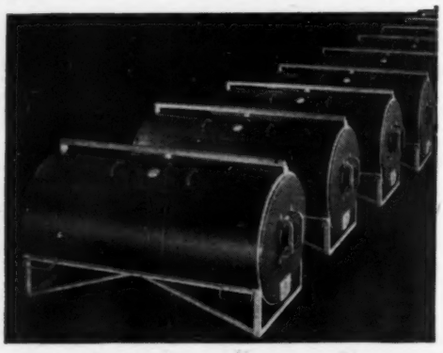
MINNEAPOLIS, MINNESOTA, AND 119 PETER STREET, TORONTO, CANADA

Wadsworth Road, Perivale, Middlesex, England: Nybrokajen 7, Stockholm, Sweden

geared to meet your needs

KIRK & BLUM

can fabricate your sheet steel and light plate work with SPEED and ECONOMY



Our business is the fabrication of sheet metal. Specialists in this field, for more than a third of a century we have been designing and fabricating sheet metal products.

Today, our plant facilities have been greatly increased and streamlined. Skilled mechanics and craftsmen of long service and experience, can fabricate your sheet metal products the way you want them. There is no guess work; specifications are rigidly adhered to. The result: you get a finished product that needs no alterations.

Everyday, more manufacturers are realizing the many distinct advantages of sub-contracting their sheet steel and light plate work to Kirk & Blum.

Today's demand for more and more speed is offset by Kirk & Blum Service. Don't delay further. Consult Kirk & Blum Engineers. Their background of specialized experience can bring to you the solution of many of your production problems.

Send your blueprints for prompt quotations.

We fabricate Stainless (all types) Aluminum, Monel, Brass, Copper, Angle and Bar Shapes.

OVER 30 YEARS EXPERIENCE in

Shearing, Punching, Bending, Stamping, Pressing, Welding, Forming, Rolling, Wiring, Edging, Hammering, Flanging, Beading, Riveting, Assembling.

The* KIRK & BLUM MANUFACTURING *Company

2835 *Spring Grove Ave.* CINCINNATI, OHIO

ment after July 1, 1942. (East Bay Transit Company.)

** WLB Orders Delinquents to Rejoin Labor Union*

WLB resolved a union security dispute by directing that members who have dropped out of the union since last Nov. 27 be required to rejoin. The decision is in effect a guarantee against disintegration of unions that might result from restrictions of labor activity because of the war production effort. (Walker - Turner Company, Inc.)

** Immunity From Anti-Trust Prosecution*

WLB has recently ruled that it has the authority to override the anti-trust law—if these laws stand in the way of swift settlement of a war industry labor dispute. This authority it claims by virtue of the War Powers of the President and the jurisdiction conferred by him on the Board.

Check-Off May Not Be Discriminatory

WLB ruled that if you grant the check-off to an employee association you must make it available to a nationally organized union which becomes the lawful representative of employees. (But the union's demand for the all-union shop was denied on the ground that there was no rival union competing for the employees' support.)

First Seizure for Refusal to Obey

For refusal to abide by an order of WLB an employer's property (a railroad) was seized in the first such case since the onset of the war. The case emphasizes the fact that if other non-compulsory means fail to bring obedience to determinations of WLB, the compulsory method of seizure will be employed in all instances in which labor disputes impede the war's prosecution. In case of a union's refusal to obey a Board order, military rule may follow.

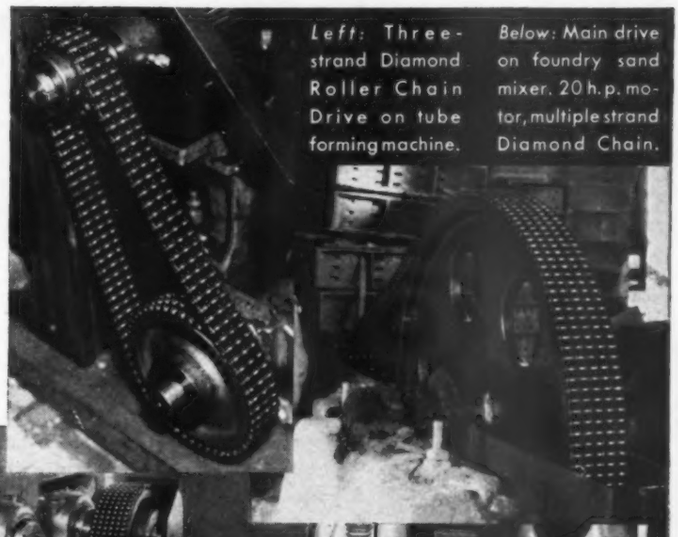
By virtue of this order all tangible and intangible assets of the railroad were seized. No attachment may be levied against its property without government consent, and wages and working conditions will be those existing prior to the dispute, until WLB otherwise determines.

Demand for Union Shop Denied

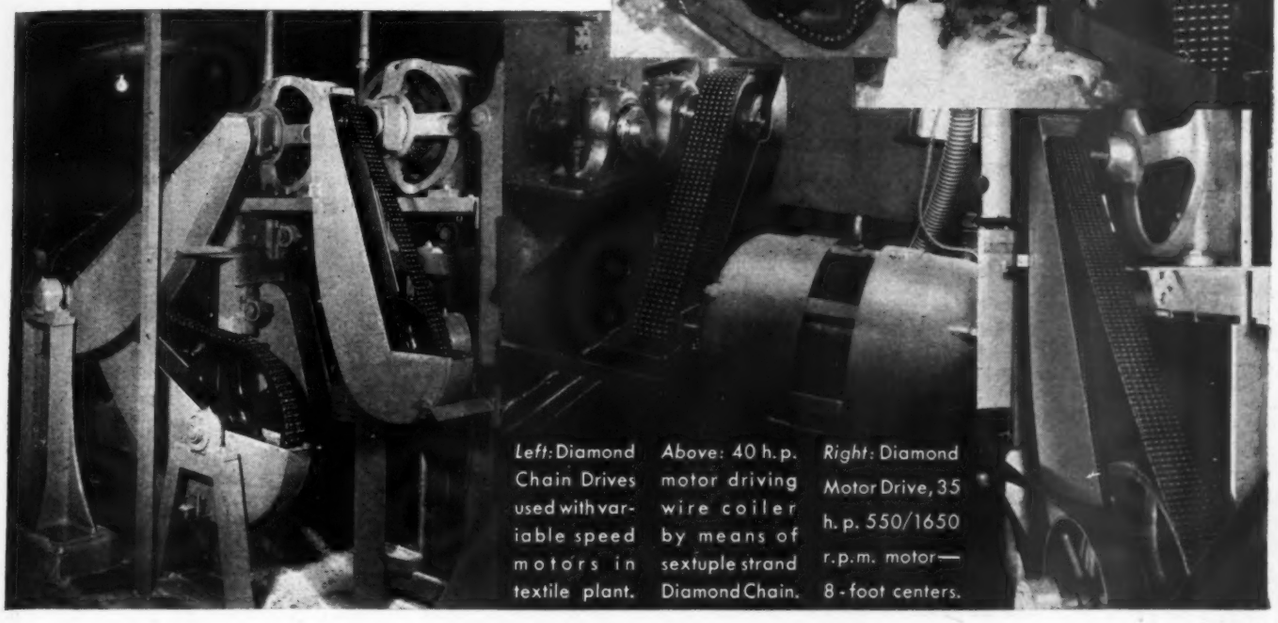
In the International Harvester Company case, the Board denied the union's demand for a union shop upon the ground that the contract

TODAY'S PRODUCTION COUNTS DOUBLE

STEP YOURS UP WITH FIGHTING POWER DRIVES



Left: Three-strand Diamond Roller Chain Drive on tube forming machine. *Below:* Main drive on foundry sand mixer. 20 h.p. motor, multiple strand Diamond Chain.



Left: Diamond Chain Drives used with variable speed motors in textile plant. *Above:* 40 h.p. motor driving wire coiler by means of sextuple strand Diamond Chain. *Right:* Diamond Motor Drive, 35 h.p. 550/1650 r.p.m. motor—8-foot centers.

● Forget what we didn't do—speed up *today's* output, for every gain today is worth many times next year's gain.

Production men are not turning down any ideas that will result in even the smallest extra daily output.

Vital in any production plant are the drives. If they slip to allow machinery to drop to less than maximum output, they are slackers . . . If they require too much maintenance, cause delays and require frequent replacements, they are holding up production . . . If they are inefficient and waste power, they tax electrical supply unnecessarily.

More Production NOW

To increase and maintain high daily production rate, to save power,—more and more plants are selecting Diamond Roller Chain Drives—most leading machinery builders regularly use Diamond Drives . . . They transfer power with practically 100% efficiency;—they do not slip, creep or bind,—they maintain exact speed ratio between driver and driven member; they do not depend on friction or tightness, therefore are easy on bearings;—they require little maintenance and are unaffected by dust, dirt, fumes, and moisture,—or long hour operation. Diamond Drives will stay fit for the duration.

To gain the last ounce of extra output—to reduce delays,—to save power—select Diamond Roller Chain Drives. Every gain today is worth many times any gains made a year hence . . . Now, 1942, is the time to act . . . DIAMOND CHAIN & MFG. CO., 449 Kentucky Avenue, Indianapolis, Indiana. Offices and Distributors in All Principal Cities.

DIAMOND ROLLER CHAINS

KEEP YOUR EMPLOYES
"ON THE ALERT"

They'll do *more* and *better* work in
LIVELY AIR

Don't let hot, dead air steal the pep and reduce the efficiency of factory and office workers. Keep them alert and on their toes this summer with LIVELY AIR—air in motion.

Proper air circulation demands quality fans, and the "know-how" to use them to best advantage. Westinghouse offers both, through 50 years of fan engineering experience. Call in your Westinghouse contractor or distributor *now*. He will help you take care of the fans you have, give you valuable advice on using fans properly.

GET THE RIGHT FAN FOR EVERY JOB
IN THE SHOP
Powerful 24-inch WHIRL-AIRE man-coolers provide wide area cooling. Economical to operate, easily serviced.
EXECUTIVE OFFICES
Smartly streamlined POWER-AIRE pedestal or wall-mounted fans circulate the air with scarcely a whisper.
GENERAL OFFICES
Wall-mounted POWER-AIRE fans, properly placed, cool large areas quietly and efficiently.
LABORATORIES
Practical, long-life PACE-MAKER desk-bracket fans provide economical cooling.

Westinghouse *long-life* Fans

about to be executed by the parties was the first one between them, and the time was not ripe for the inclusion of a union shop clause.

Wage Increases Allowed and Denied

WLB granted a wage increase although employer was already paying wages which were on a par with the average wages in the area (St. Louis Smelting & Refining Company), but denied a wage increase and a request for a union shop on the ground that granting same "would upset prevailing standards in Arizona as established by union contracts." (Phelps Dodge Corporation, Douglas Smelter.)

Penalty for Slow-Down

The Board recommended the discharge of four employees of the Aluminum Company of America for instigating a slow-down.

NATIONAL LABOR RELATIONS BOARD

Labor's Immunity From Anti-Racketeering Act

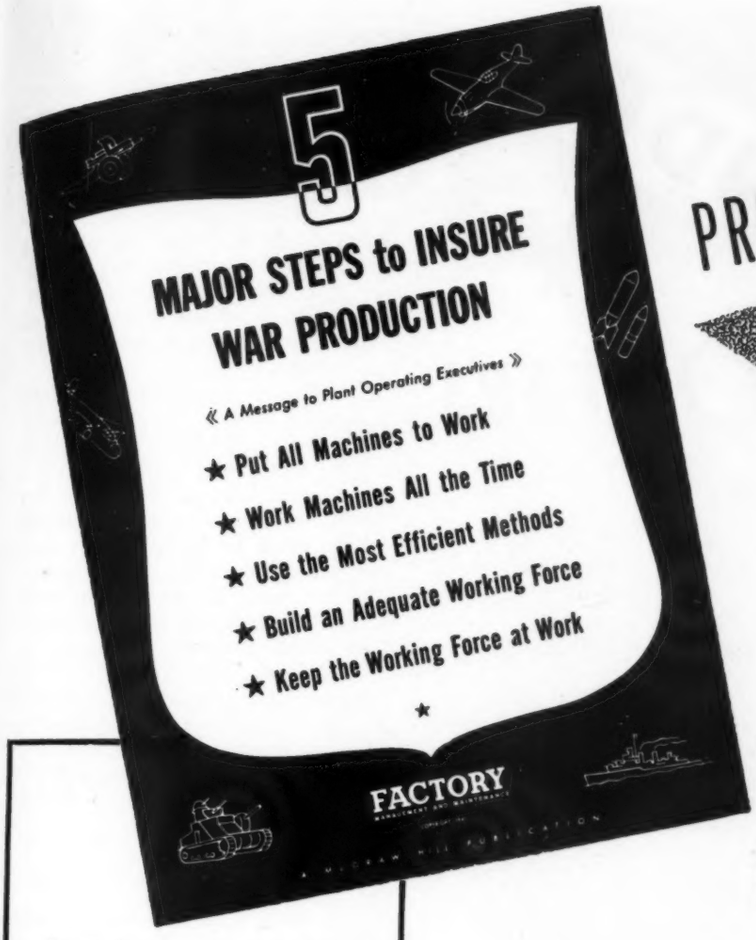
In one of the most far-reaching decisions of the year labor has, in effect, been held to be beyond the reach of the Anti-Racketeering Act. This ruling invoked the vigorous dissent of the Chief Justice who denounced the majority view as encouraging common law larceny. (U. S. vs. Local 807 of International Brotherhood of Teamsters.)

State Anti-Picketing Act Upheld

Other decisions of the High Court have upheld a provision of the Wisconsin Employment Peace Act controlling picketing, and accentuated the mounting opposition to the use of violence. The Wisconsin Act made it an unfair labor practice to cooperate in picketing or boycotting without first obtaining approval by secret ballot of a majority of the employees in the collective bargaining unit. Curbing picketing which is accompanied by violence, declared the United States Supreme Court, does not deny minority rights of free speech and assembly guaranteed by the Fourteenth Amendment or prohibit peaceful picketing. The control of such picketing is properly within the police power of the state. (Hotel & Restaurant Employees' International Alliance, Local 122 vs. Wisconsin Employment Relations Board, No. 124.)

State Act Banning Restraint Upheld

The occasions for reconsidering the effect of violence on the right to picket were a Texas statute. Some


5
MAJOR STEPS to INSURE WAR PRODUCTION
« A Message to Plant Operating Executives »
★ Put All Machines to Work
★ Work Machines All the Time
★ Use the Most Efficient Methods
★ Build an Adequate Working Force
★ Keep the Working Force at Work
★
FACTORY

McCASKEY PRODUCTION CONTROL

HELPS PUT ALL MACHINES TO WORK ALL THE TIME . . .

The scheduling of machines for maximum production is particularly difficult today. Difficult, but of extreme importance. Schedules frequently must be changed because of priority requirements, material and tool shortage, and other unexpected developments. McCaskey Machine Control readily meets these severe demands.

The jobs running and additional jobs scheduled to each machine, the production hours they represent, the date to which each machine is loaded and other essential information are made available almost at a glance with very little clerical work. Effective planning of departmental production is the natural result, enforcing production in the sequence necessary for assembly requirements and shipping schedules.

The procedure is so simple that it is easily and quickly installed in the busiest plants. It is used with equal success for the control of single machines or groups of similar machines; individuals or crews; production, assembly or maintenance. First cost and operating expense are surprisingly low.

Equipment and procedure are illustrated and detailed in bulletins available promptly on request. Experienced plant men will call to discuss your requirements and offer recommendations without obligation. Write today.

REPORTS FROM PLANTS USING **McCASKEY PRODUCTION CONTROL SYSTEMS . . . .**

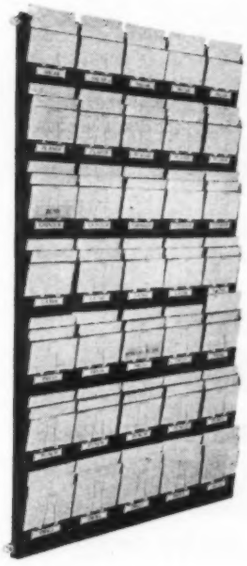
The following from a well-known Detroit manufacturer is typical of many other reports of specific advantages resulting from the use of McCaskey Control . . .

"Scheduling from one to ten jobs a day to 170 machines involved frequent headaches until McCaskey Machine Control was adopted in the spring of 1937. The parts for seven divisions (of this company) are machined in this plant. Under normal conditions, rush orders from several divisions invariably are demanding special attention in addition to the usual flow of production. Delivery dates often are difficult to meet—or were, before McCaskey methods simplified the problem.

"We can now determine at a glance the total hours of work on hand for each machine. Jobs are scheduled so that machines are loaded evenly and used most advantageously. Delivery dates are met and precedent is readily given to rush jobs.

"When production volume is at a peak, reference to the work on hand for each machine quickly indicates the shifts required to clear it up without delay.

"These results have been secured with a minimum of clerical work and with a surprisingly small original investment. McCaskey Control has been most satisfactory to us."



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McCaskey Systems, Ltd., Galt, Ontario, Canada. *The McCaskey Register Co., Waterford, England.*

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Bert Tucker, Waterloo, Iowa

• The new exchange addition of the Northwestern Bell Telephone Company, Waterloo, Iowa, is protected by a

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20-YEAR BONDED
BUILT-UP ROOF

A study of the records of thousands of CAREY Built-Up Roofs shows that many are still on the job after 25, 30, 35, some even 40 years of service. The life of this roof, therefore, by the law of averages, should extend well beyond its bonded period.

This is extra value you get in CAREY Roofs without extra cost. Whatever your roof needs, put them up to CAREY for value PLUS. Write Dept. 31 for details.

THE PHILIP CAREY MANUFACTURING COMPANY • Lockland, Cincinnati, Ohio
Dependable Products Since 1873
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two years ago the United States Supreme Court, in the famous case of NLRB vs. Fansteel Metallurgical Company, barred sit-down strikes and violence from the protection of the Wagner Act.

From that time to the present the Labor Board has frequently and with much success whittled down that limitation to the point of requiring reinstatement even where the violence was of major proportion. This relaxation of the Fansteel doctrine has produced marked repercussions in certain states.

Specifically, individual states have undertaken to curb picketing and the courts have sustained these curbs, holding that if the right to picket is to be enjoyed as an exercise of free speech, the means as well as the objectives must be lawful. One such ban, which involved a Texas statute, has been tested before and approved by the United States Supreme Court. That statute forbade coercing an individual in the lawful conduct of his business. The Supreme Court held that the recognition of peaceful picketing as an exercise of free speech does not mean that the state cannot limit such picketing to the sphere directly related to the dispute.

Picketing Peddler System Approved

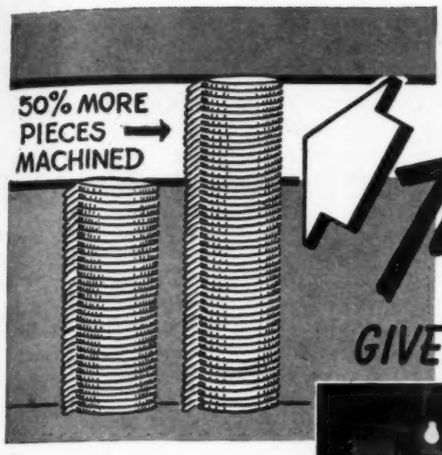
On the other hand, the High Bench, reversing the New York Court of Appeals, ruled 8 to 0 that a labor organization had the right to picket peddlers of bakery products in New York City, in an effort to induce them to employ a union relief driver on Sunday instead of working seven days a week themselves. The Supreme Court in this case saw no such abuse "through the use of excessive picketing" as would justify limiting labor's right to free speech.

Right Not to Bargain

Where the Labor Board has not determined the appropriate unit, the employer's refusal in good faith to deal with the union except on the basis of what he considers the appropriate bargaining unit is not an unlawful refusal to bargain. (Bonafide Mills, Inc.)

** Duty to Bargain Includes Contract Interpretation*

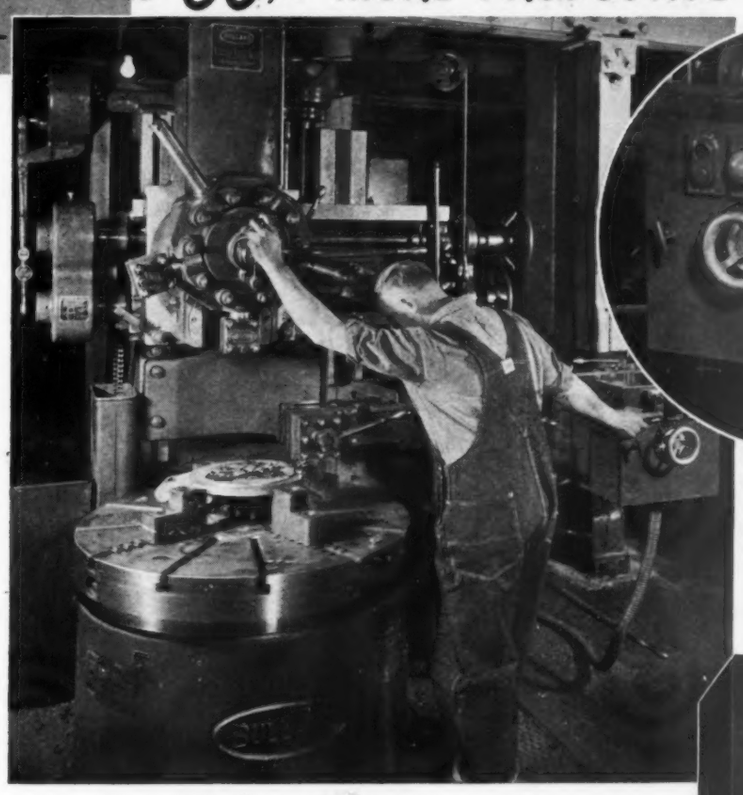
Not long ago the United States Supreme Court, in interpreting the duties of management under the Wagner Act, held that the duty to bargain requires a *willingness to reduce the agreement to writing.* (NLRB vs. Heinz Company.) In further amplification of the employer's duty, the



With this EC&M Turret Lathe Control

CONSTANT "METAL REMOVED SPEED" GIVES 50% MORE PRODUCTIVE CAPACITY

★Control—only a small part of the cost, yet a vital factor in determining the efficiency of a machine. Here, control—only 7% of the total cost—makes output 50% greater, the equivalent of 2 machines doing the work of 3.



(*Above*) EC&M ball-bearing-equipped rheostat with fast-slow, stop, start-jog push buttons on cabinet-door. Rheostat is geared to side head tool holder for automatic operation. It can be disconnected for manual adjustment when desired.

WITH this unique turret lathe control the "metal-removed-speed" remains constant. This assures fast operation and use of the cutting tool at its rated capacity. It is accomplished by automatically increasing the speed or r.p.m. of the table as the diameter of the cut decreases. It results in increases as high as 50% in productive capacity.

For example, in machine-facing a 15″ diameter casting, the same amount of metal per second is removed when the diameter of the cut has been reduced to 5″ as at 15″, because table-speed is three times faster than when first starting to cut at the 15″ diameter. By this method of control, the *floor-to-floor time* per 15″ diameter piece averages *5½ minutes compared to 10½ minutes* for machining a similar piece but under constant table-speed conditions.

The adaptability, ease of operation, convenience of push buttons and rheostat and maintenance of uniform cutting speed have resulted in increased productive capacity—*equivalent to another half machine according to the superintendent.* Full details sent upon request.

EC&M *Line-Arc* Magnetic Contactor, Dynamic Braking Controller with resistors completely wired and self-contained in ventilated enclosure on top of the controller-cabinet.

THE ELECTRIC CONTROLLER & MFG. CO.

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MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS AND MEADE STREETS, PITTSBURGH, PA.
Representatives in Principal Cities

Circuit Court of Appeals now holds that the duty to bargain also includes the duty to bargain over the interpretation of the agreement. *An employer's refusal to confer on the contract's meaning is, therefore, an unfair labor practice.* (Rapid Roller Company.)

Employer Not Obligated to Accept Terms

The arrival of an impasse in negotiations in which the union takes the final position that it will not sign any contract which does not contain either a closed shop or arbitration clause does not mean that the employer has refused to bargain. The NLRB, in absolving the employer of the charge, took into account the circumstances that he had met with the union whenever requested, consented to reduce to writing any terms agreed upon, and showed his good faith by granting some of the demands of the union. (Montgomery Ward & Company.)

When Labor Cedes the Right to Strike

It is permissible to bargain away the right to strike. However, if the right is given away, the law will presume that the union so agreeing is subservient to the employer. (Metal Mouldings Corporation.)

Union May Not Enforce Wage Clause for Its Members

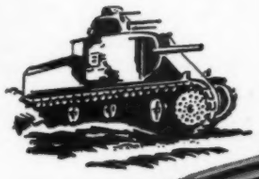
The employees may recover such wages only by suit, although the union is entitled to be a party to the suit for the purpose of obtaining a declaratory judgment on the interpretation of the contract. The reasoning of the Court: The contract with the union amounts to an understanding that certain wages be paid to such members of the union as care to accept employment on those terms. When a worker accepted employment, he accepted the terms. (Milk Wagon Drivers Union of Chicago vs. Associated Truck Dealers, Inc.)

Union Denied Policing Power

A union may not take disciplinary measures or even entertain charges against members who refused to obey a call to engage in a strike which the court finds to be illegal. The strike call was in violation of a stabilization agreement which was binding on the local and its members. (Coyne vs. United Association of Journeymen Plumbers and Steamfitters.)

Penalizing Violation of Contract

Stopping of work by employees before the end of a scheduled shift because



Vital LINKS for All-Out Production

MORSE

SILENT and ROLLER CHAIN DRIVES

Meet Every Demand
No Slip—No Power Waste

Power drives are vital in today's production rush. Beware of inefficient drives that cut down production through slippage and power waste.

Take advantage of Morse Silent and Roller Chain Drives. Their compact design, rugged construction and proven performance are your assurance of efficient power transmission and peak production. Smooth, dependable in operation, they set new records of trouble-free, economical service.

Morse Silent Chain Drives embody the famous patented "Rocker Joint" that rolls, not slips, the load—resulting in minimum resistance and wear for maximum efficiency and long life.

The Morse man in your territory will gladly assist in any of your drive problems—call him.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP.

Don't Let "Smoke Lag" Slow Down Your Army of Workers

"Give 'em Air" with Swartwout Ventilation* and You Give Them a Better Chance to Do a Day's Work

SOLDIERS couldn't give half the battle if they had to *fight indoors.* You can't expect workmen to "Beat the Promise" in stuffy smoke-laden atmosphere. • Chase "Smoke Lag" out of your buildings with Swartwout *Controlled* Air Circulation, applied through the sturdy, low-upkeep Swartwout-Dexter Heat Valve. • Its large air-moving capacity and ease of installation solve your ventilation problems quickly at moderate cost. • Make "air-room" for more workers with better ventilation . . . write today for Swartwout 1942 Ventilator Catalog.

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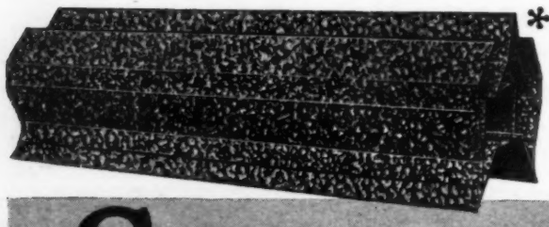

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•
SWARTWOUT MULTIPLE HEAT VALVE
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SWARTWOUT AIRJECTOR (Rotary-Power)

Swartwout

VENTILATION SPECIALISTS

Also Swartwout Power Plant Equipment

they do not consent to work overtime was held by an arbitrator to be proper ground for imposition of penalties. The contract arbitrated contained a "no-strike" clause and a further clause authorizing management alone to schedule shifts and impose disciplinary action.

Majority Consent Required for Closed Shop

A collective bargaining agent does not have the blanket right to negotiate a closed-shop contract, but may do so only if it has been specifically authorized by its members to make such a contract. (NLRB vs. Mason Manufacturing Company.)

Vacation a Property Right

Employees, whose vacation periods fell in weeks in which they were on strike, were held entitled to vacation pay for those weeks. This ruling, made by an arbitrator, was rendered despite the fact that the employee may have spent his vacation time on a picket line rather than in recreation. An earned vacation, ruled the arbitrator, is a property right and may even outlast the life of the contract.

Salesmen Protected by the Wagner Act

The salesmen refused to perform the unaccustomed duty of accompanying trucks which were being driven by employees hired to replace the strikers, objecting that this duty would make them strike breakers. The employer claimed that the salesmen discouraged customers from buying while the strike was in progress, but the Board found that the employer did not know this at the time of the discharge; hence the discharge was discriminatory. (United Biscuit Company of America.)

Effect of Discharge

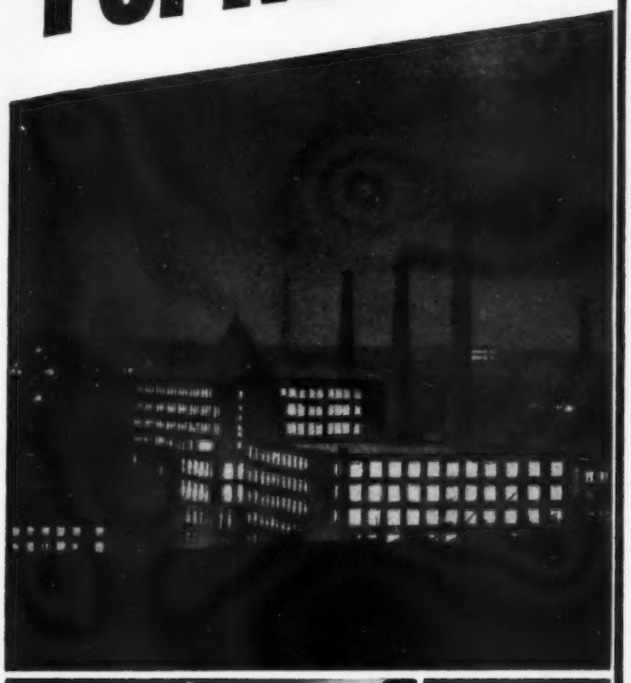
An employer who discharges an employee pursuant to the demand of a union is guilty of illegal discrimination and must reinstate such employee with back pay. (Ismithian S. S. Company.)

Employer Activity Further Limited

Since an employer may not render any financial aid to a union, no agreement on his part can legalize such an arrangement. (Curtiss-Wright Corporation.)

And under the most recent pronouncement by the United States Supreme Court on this phase of employer activity, an employer may not assist a union in securing new members, even

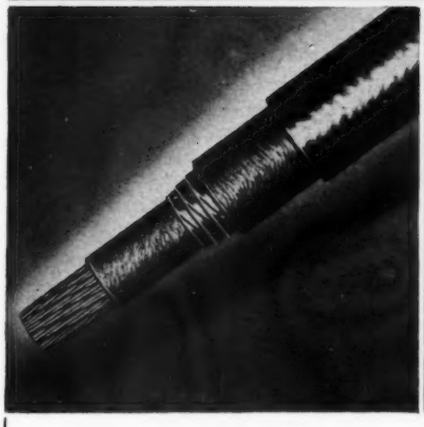
For Non-Stop Production



Use Wire that Won't Bake, Burn or Rot

Wire failures that interrupt production occur most frequently in the hot spots —around boilers, furnaces, steam lines, ovens, lehrs, soaking pits or places where heat and moisture, oil, grease and corrosive fumes can't be avoided—and the insulation-destroying conductor heat developed by today's overloads does its share of damage, too.

But steel mills, power plants and many vital industries are maintaining non-stop operating schedules by using *permanently insulated* Rockbestos wires and cables for power, control and lighting circuits, because their insulation is designed for severe service. It won't bake out and crack; won't swell, flow or rot; and won't burn or carry flame.



Rockbestos A. V. C. Motor Lead Cable. For coil connections, motor and transformer leads. Resists heat, flame, moisture, oil and grease. Insulated with felted asbestos, varnished cambric, felted asbestos and asbestos braid. Sizes: No. 18 AWG to 1,000 MCM—600 volt. Underwriters' and Nat. Elec. Code Type AVA, max. operating temp. 110°C. (230°F.).

Rockbestos A. V. C. Power Cable. For power circuits and general hot spot wiring in boiler rooms, steam tunnels, etc. Laminated felted asbestos—varnished cambric insulation and asbestos braid is heat, flame and moisture resistant. 600 to 8000 volt ratings. No. 18 AWG to 1,000 MCM, 600 volt, Underwriters' and Nat. Elec. Code Type AVA, max. operating temp. 110°C. (230°F.).

Rockbestos A.V.C. Boiler Room Wire. For lighting and control circuits exposed to heat, moisture, corrosive fumes, oil, grease and fire hazard. Insulated with varnished cambric, felted asbestos and asbestos braid. Sizes: No. 18 AWG to 4/0—600 volt (No. 6 to 4/0 insulated like power cable). Underwriters' and Nat. Elec. Code Type AVA, max. operating temp. 110°C. (230°F.).

Deliveries: Priority preference ratings control deliveries. Specify minimum footage requirements when ordering and send in preference rating papers. Samples and catalog on request.
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30 R&M HOISTS Speed this Firm's War Work!

◀ This view (with cover removed) shows the extreme simplicity of the R & M hoisting mechanism. Compact assembly reduces the amount of headroom and gives maximum strength. The entire mechanism can be removed after the cover is taken off.

There are no jams, no wasted time and effort in this war-geared plant! Material and finished products move like clockwork with the help of 30 R & M hoists.

You see three of the newest in action above. They're Cleveland Tramrail mounted 2-ton, all-steel super-production models with pendent, push-button control and a hoisting speed of 20 feet per minute. And spotted in other departments of the plant are 27 more R & M hoists, ranging from half-ton bantams to 5-ton huskies.

R & M hoists have provided the answer for faster material handling in all parts of the country. Their low headroom, ability to handle loads from any angle with perfect balance, and sturdy construction for trouble-free, year-around performance make them first choice for all types of industry.

Get in touch with nearest R & M sales and service office now. Or write the factory direct for complete details. It will pay you to "take it up" with R & M.

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Houston..3715 Harrisburg Blvd.
Jacksonville....305 Bisbee Bldg.
Newark.....700 Bergen St.
New York.....200 Varick St.
Philadelphia...401 N. Broad St.
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HOIST & CRANE DIVISION • SPRINGFIELD, OHIO

MOTORS • FANS • MOYNO PUMPS • FOUNDED 1878

though the union is a bonafide national labor organization and had secured a majority of the employees in the plant before receiving any assistance from the employer. (NLRB vs. Electric Vacuum Cleaner Corporation.)

** Employer's Obligation to Reinstate Is Limited*

The Supreme Court in a 5–4 decision set a new limitation on the authority of the NLRB to order reinstatement of strikers. Even though the strike is caused by unfair labor practices of the employer and no violence or disorder occurs, the Board may not order an employer to reemploy seamen who strike against their officers on board a vessel anywhere within the admiralty jurisdiction of the United States—even if the ship is safely tied up to a dock. (Southern Steamship Company vs. NLRB.)

An employee convicted of assault and battery against a nonstriker is not entitled to reinstatement.

On the other hand, if strikers withhold funds collected for their employer which would ordinarily be turned over to him had there been no strike they are not disqualified for reinstatement. (Quality & Service Laundry, Inc.)

Our Goal for 1942: A Million Pounds of Cardboard Saved

(Continued from page 91)

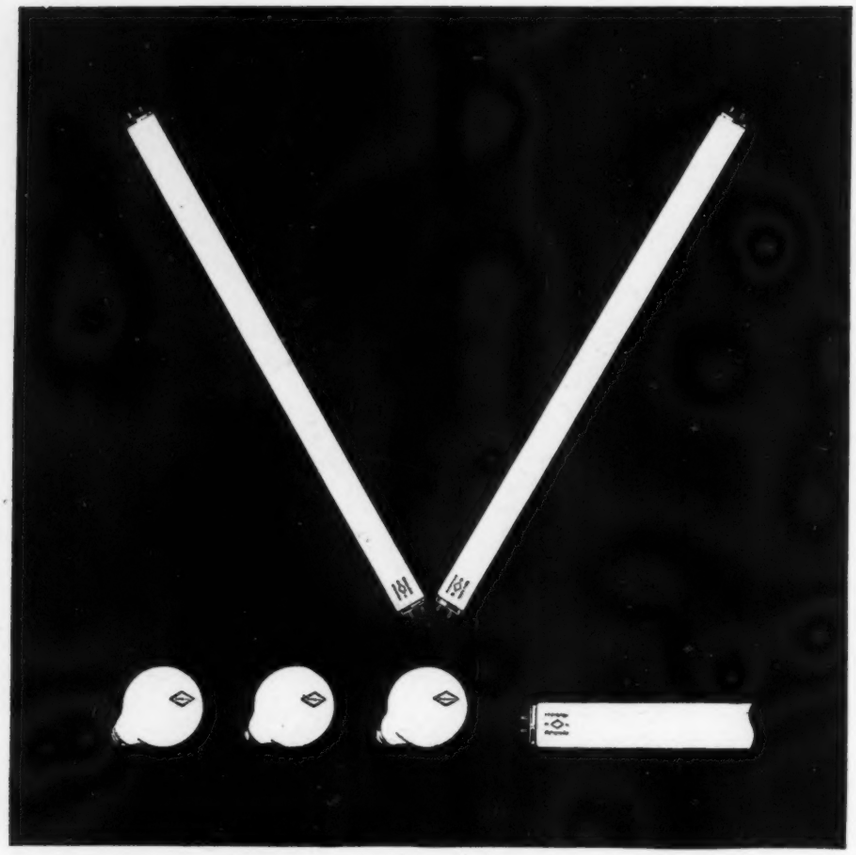
ninety-three different items were listed as to type of box or part, construction, and kind of board used. It developed that "flat goods"—hot water bottles, combinations, and fountain syringes—covered twenty-six items which were not packed in standard-sized boxes. These are in the process of being changed so that in the end there will be only three box sizes for Goodrich water bottles and combinations combined, and three sizes for fountain syringes to cover our high, medium, and low-priced lines. While this does not effect any appreciable saving, it will help when making the boxes, and in many cases cut down scrap by standardizing sheet sizes.

Another change was in the quantity packed in the corrugated shipping cases. We retained the 12- and 36-pack sizes, but dropped the 24-pack size. This reduced the number of shipping-case sizes for hot water bottles and syringes to 10 and will save an estimated 18,419 shipping cases, or 16,118 pounds of corrugated board a year.

You have seen fountain syringes

PLEDGED to all-out aid to America's fighting forces, NORMA-HOFFMANN is devoting all its resources and its 31-years' experience, to the production of PRECISION BEARINGS for the Army, Navy and Air Corps, and for manufacturers of armament and equipment.

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.
BALL, ROLLER AND THRUST BEARINGS • FOUNDED 1911



ELECTRIC LAMPS form an appropriate symbol of VICTORY. American production holds the final key to victory. Maximum production means good lamps and lots of them.

The makers of Champion Lamps are proud to contribute the entire skill, experience and resources of one of the country's largest organizations of specialists in fine lamp manufacture to the end that American Industry may be supplied with good, dependable lamps at lowest possible cost using the minimum amount of critically needed materials.

The distributor of Champion Lamps nearest you is equally prepared to do his part toward helping you to achieve the common objective.

If you're not already in touch with him may we give you his name?

CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

Champion Lamps are licensed under General Electric Co. incandescent and fluorescent lamp patents

and hot water bottles displayed in drugstores. You recall how the rubber bag is fastened at the top end with a metal button; for a water bottle there is often a button at the bottom, too. Well, priorities shut down on these buttons. A minor item, of course, but we were using several hundred pounds of metal for them every year. What to do? We could not just throw the syringe bag in the box to shift for itself. A little experimenting, and we looped a tab of thin cardboard through the eye of the rubber bag to hold the top end in place. With the cheaper flat goods we use a length of tape and tie the rubber bag in place at the top.

We also tested lighter and simpler materials for these boxes. We had been using 0.038 patent-coated, news backboard. We switched to 0.034 patent-coated, kraft-colored, news back. We reduced the weight from 137 to 113.45 pounds per thousand square feet, this only after a laboratory report plus our own tests to make sure that the lighter board would stand the gaff.

After a further check on fountain syringes and hot water bottles, we decided to eliminate a window frame of cellophane with a cardboard rim from the top grades. This produced a further immediate saving in board, which we estimate at 13,402 pounds a year, and also some small saving in labor.

Save Board, Not Money

Incidentally, it can be stated that some of these packaging changes do not immediately save us any money in the cost of the remodeled carton, but they do save the industry considerable board, and that is what we are after.

There is also a small saving to the company in the carrying charge and delivery of the new and lighter cartons to our trade. In express or air express shipments this can be quite an item.

We had been packing a good many items—bulb syringes and the like—in full-telescoping cartons, with labels pasted on the front end of the covers. By changing over to a lid 1¼ inches deep and pasting the label on the box itself, we expect an estimated saving of 14,434 pounds of boxboard during 1942 and every year thereafter.

Goodrich makes and sells hundreds of thousands of tube-repair kits—fiberboard cans containing rubber cement and an assortment of tire patches. They will probably grow increasingly popular during the years ahead. Competition plus the desire to give special customers something impressive, handsome, and different had led to our using 13 sizes of fiberboard cans, some of them larger than the contents actually required. We cut the 13 can

DON'T FORGET

that for circuit and motor protection you ought to use

THERM-A-TRIPS

(fuses with thermal cutout)

which end needless interruption, but never interfere at any time with safe operation. Their time-lag feature allows motors to start or run on normal overloads, but they protect against excessive overloads and short circuits. No moving parts, no mechanism to set, no other other overload protection is required, and they operate regardless of length of time in service. For individual motors or circuits with motor-driven apparatus they are the most complete, positive, flexible and economical protection you can have. Plug type, 125 volt, shows on examination whether blown by overload or short circuit. Ask your dealer about THERM-A-TRIPS today, or write for our Bulletin 405.

THE CHASE-SHAWMUT COMPANY
NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS SINCE 1893

Many times more efficient than men in times of blackouts, storm and fog, and when most protection devices are practically useless, A.A.I. Automatic Alarm Systems now aid human guards in patrolling miles of high wire fence enclosing defense properties and plants. Tiny "robot sentries" or detectors, attached at intervals along the line of fence, serve as super-sensitive "ears" in detecting and reporting, by both visual and audible signals, the presence of saboteurs or other unlawful intruders. A.A.I. Automatic Alarm Systems provide modern, accurate, uninterrupted protection under even the most adverse conditions. These systems may be installed by plant engineers, require little or no servicing and are available at a cost permitting even small factory installation.

Write for Literature.

Licensed under DuPont and Astatic Patents

AUTOMATIC ALARMS Incorporated

832 Market Street YOUNGSTOWN, OHIO, U. S. A.

SAVE MEN
& SPACE & TIME

Stacking
Storing
Loading
Maintenance

Lifting speed 35' per minute, reversible roller platform, husky 6" Service Forge-Weld Casters, strong stable telescopic frame.

• Two men and a Service Lifter piled 14,000 heaters five high as shown in the picture at 48 an hour!—a job for 4 to 6 men without one of these portable electric or hydraulic elevators. Every man hour counts in most plants today, and the reduction of 50% in handling cost was desirable, too. Efficient use of warehouse space was another significant value. A Lifter also speeds maintenance on high walls and ceilings. Get the whole "sweet" story in a bulletin which will help you decide whether a Service Lifter should go to work for you. Write us.

SERVICE CASTER & TRUCK CO.
Eastern Factory: 434 Somerville Ave., Somerville (Boston), Mass.
Toronto, Canada: United Steel Corporation, Ltd., SC&T Co. Division.

505 N. Brownswood Ave., Albion, Mich.

SERVICE
MOBILIZERS of INDUSTRY
CASTERS, TRUCKS AND CUSTOM UNITS

sizes down to 4 and the 23 shipping-carton sizes down to 8. This will represent a possible saving of 9.6 to 38.7 percent per can, depending on the previous size, or an actual saving of 13,078 pounds of fiberboard a year.

Our garden hose has always been made in several styles and prices in accordance with competition. The best grade was packed in a two-piece octagon-shaped box, imprinted in yellow and green. We found we could save 36,368 pounds of corrugated board a year by eliminating this box and substituting cardboard disks, to which the hose was tied with tapes. Later we decided to eliminate these disks entirely and package five 50-ft. lengths, coiled, tied up, and packed in bulk in a shipping container. Savings —an added 27,770 pounds of corrugated board per year.

No More Cartons

Fan belts were always held together with a cardboard sleeve and packed six in a carton. We retained the sleeve but dropped the carton, packing 25 fan belts loose in a box. This change has been accepted by the sales department—at least for the duration—and will save over 61,000 pounds of board a year on a normal year's production.

Some changes permitted introducing new ideas in packaging. Whenever we decided to improve a package we had an artist design something new and then studied it. Every move was handled by the company's own packaging engineers, who are a part of the factory service division.

In some cases, with the full approval of the sales department immediately involved, it was decided to eliminate various display cards which once had seemed essential. This brought about a prompt economy. Likewise, in our bulk package of surgeon's gloves we now print an instruction sheet on paper stock instead of cardboard. That saves more than you would think.

It was found possible to work closer both with our own regular suppliers and also some Goodrich fabricators and large distributors. For instance, the yarn used for weaving fire hose reaches our plant in Akron on cardboard tubes. Formerly the tubes were scrapped or at best sent to the paper baler along with the other usual waste. But not any more. In the last two months we returned 280,699 tubes with a saving of approximately 15,000 pounds of fiberboard to the cotton mills.

We used to pack Koroseal batch stock in telescoping fiber drums. Now we pack the stock inside a corrugated carton and strap it to a wooden pallet. Thus we can place 1600 to 1800

ON A MODERN PURSUIT

It's Fire Power

● 400 miles an hour. Only time for a two-second "burst." You've got to have FIREPOWER—concentrated, smashing, decisive!

The same trigger-fast action is needed on the Production Line too—but here it's FACT-POWER . . . power to thwart delay, coordinate control. It's a job for *records*. And Kardex is the one best fact-finding record because it *signals* vital facts for instant administrative action.

Everywhere on the Production Front you'll find Kardex records spuring management with the Fact-power needed to bolster output. Kardex Visible PRODUCTION records to maintain maximum output. PROGRESS records to keep production on schedule. PERSONNEL records to place the proper men on the job. MACHINE LOADING records to attain maximum yield. And PROCUREMENT records, like the one below—now serving war industries—to supply the facts that prevent delays in delivery of vital materials. Remington Rand is at your service. Write or phone today with *any* record problem. No obligation. Remington Rand, Buffalo, New York. *Branches everywhere.*

ON THE PRODUCTION LINE *It's Records!*

● You glance down the Kardex slide. No need to "dig" underneath—retarded deliveries, low supplies are visibly signalled, instantly identified.

● A colored signal *visibly* indicates the date suppliers should be "followed" to assure delivery. When the order is in, the signal is removed.

● The exclusive Kardex Graph-A-Matic signal visually reflects your number of weeks' supply of tools on hand *in terms of current consumption.*

KARDEX *visible systems of* **PRODUCTION CONTROL**

REMINGTON RAND INC.

"VICTORY IS OUR ONLY OBJECTIVE"

Meier Nu-air
TRADE MARK REGISTERED
FANS

Pedestal Type Man-Cooler Fan —easily transported — fully protected.

FRESH AIR for fast, efficient production

Avoid slowdowns and lag in production by providing comfortable, cooler working conditions for the workers in your plant. Give your men and women the refreshment they need when and where they need it—with MEIER NU-AIR MAN COOLER Fans—Keep air fresh and pure with MEIER NU-AIR EXHAUST FANS.

Meier fans move an extraordinary volume of air at low current consumption. MAN COOLER FANS can be placed quickly and easily at any point where needed; exhaust fans are ideal, quiet units which can be installed in any convenient place for removing fumes, dust, excessive heat, etc.

Meier Nu-Air Fans are made in a complete line of sizes and types from 12" to 72". Write for Catalog giving full details.

Exhaust Fan—quiet in operation—high in efficiency.

MEIER ELECTRIC & MACHINE CO.
3525 E. Washington St.
INDIANAPOLIS, IND.

pounds of stock in the large corrugated box as against 300 in the former single-use drum. We figure this will save us 208,800 pounds of board a year. Six of the old drums weighed 141 pounds as against 26 pounds for the new box—and, best of all, the fabricating plant returns the empty flat and the pallet. Each corrugated box survives many trips.

Salvage is never exciting, and we list it last. But it is a fact that if cartons are opened carefully many of them can be used over and over again.

Goodrich now brings all empty cartons to an inspecting department where sound cartons are sorted for size, previous stencils blacked out, and the cartons knocked down, bundled, and sent to the stockroom under a stock number, along with new cartons of the same size. The resultant cash saving more than repays the small labor cost, and the patriotic saving in vital cardboard needed for military uses just now is tremendous. In the last three months this has saved us 115,027 pounds of corrugated board.

These savings are just a start. Goodrich packaging engineers know now how to look for economies and how to bring them about.

Welcoming the New Man

(Continued from page 93)

All raises are handled through the foremen. Overtime is paid for at the usual rate of time and a half for anything over 8 hours a day, or 40 hours a week. The company pays double time for work on Sundays. The pressure of defense production requires working many parts of the shop seven days a week. Weekend work is evenly divided by schedules. The work week begins at 7:10 on Monday morning. Payday is on Thursday for the preceding week; a newcomer receives his first pay on the second Thursday he is in the shop.

The work we do here is of vital importance to our country. To attain maximum output, cooperation in maintaining good discipline is more necessary than ever. We are expected to stay on the job until quitting time.

Standard times are specified for each production job. The percent of this standard that each man makes on each job is recorded. Unfortunately not all working time is spent directly on production. Time spent on "indirect labor" is not included when figuring a man's "percentage." "Off per-

How this Stainless Tubing BOOSTS War Production and CONSERVES Vital Metal . . .

In making parts for planes, tanks, machine guns, ships, etc. - -

FASTER FABRICATING

is possible with Carpenter Welded Stainless Tubing. Its ductility and uniform structure mean *easier* bending, cutting and welding. Expanding and flanging can be done *faster* with fewer rejects. As tubing shapes are natural design units, parts can often be finish formed by merely swaging, flanging, tapering, etc.—with a *minimum of machining.*

METALS CONSERVED

by using this tubing can be used to make *more* war machines and processing equipment. Scrap losses are minimized as this tubing is made from strip. Uniform wall thickness permits using lighter gauge tube. And *less machining* in your plant means *time saved* and *metals conserved.*

PHYSICALLY,

Carpenter Welded Stainless Tubing offers these advantages to designers, fabricators and users: a variety of Stainless types to meet specific performance requirements; high *resistance to heat and corrosion;* meets *Army* and *Navy* specifications; each length 100% *hydrostatically tested.*

STRENGTH!

This piece of tubing (from a regular production run) was flare tested to determine the strength of the weld. When the break occurred, it was AWAY FROM the weld. This tubing can often carry loads formerly supported by solid bars or heavier-walled tubing.

IF you are an engineer doing experimental or research work, ask to receive our "Quick Facts" bulletins. They provide users of Stainless Tubing with tips to help speed production and make each length of tubing work harder. A note on your company letterhead will bring you "Quick Facts" bulletins.

THE CARPENTER STEEL CO.
WELDED ALLOY TUBE DIV. KENILWORTH, N. J.

Carpenter
WELDED
STAINLESS TUBING

but RIGHT NOW the VITAL question is . . . WILL IT HELP WIN THE WAR?

KENNAMETAL
The Accepted
STEEL CUTTING CARBIDE

The chief job of every American these days is to do everything in his power to win the war. Every man and every machine should be used to that end. Costs, deliveries and other normal considerations are secondary.

By machining hardened steels faster than was ever possible before, KENNAMETAL is performing a valuable service in helping to win the war. KENNAMETAL tools often cut machining time in half—as compared to high speed steel tools—and their high wear resistance gives users three to ten times more pieces between regrinds.

KENNAMETAL is being used throughout the country for speeding production of shells, tanks, aircraft and other armament. If you turn, bore or face steels up to 550 Brinell, it can help you produce more pieces per hour.

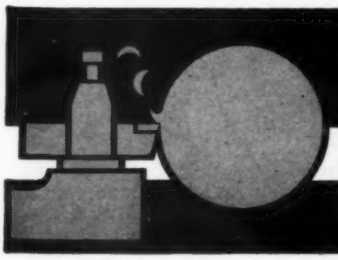
Save time by ordering KENNAMETAL blanks and brazing your own tools. Simple instructions for brazing, grinding and using are included in our new vest pocket booklet. Write for your free copy today.

KENNAMETAL tools cost no more than other carbide tools. They last nine times as long as high speed steel tools. The technique of using KENNAMETAL efficiently is easily learned.

Style #21

Style #11

Style #Y



McKENNA METALS Co.

130 LLOYD AVE., LATROBE, PENNA.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
(Exclusive of Canada and Great Britain)

ROLLING TO VICTORY!

INDUSTRIAL WHEEL TRACTORS
● BREAK BOTTLENECKS
● SPEED-UP MATERIALS HANDLING

ON HAULING
Keeping a steady stream of materials flowing from one department to another is the job of the Model IB (above) and IU Wheel tractors. Built low, compact, with short-turning radius, these heavy-duty outfits are ideal for fast hauling in and around narrow quarters . . . up steep ramps!

ON CRANE WORK
The fast, flexible operation of the Allis-Chalmers tractor-mounted cranes are saving many a factory a loading and storing bottleneck. These outfits lift, load, stack, transport . . . Model IB, materials up to 1,800 pounds . . . Model IU (above) up to 4,000 pounds. Boom lengths to 21 ft.

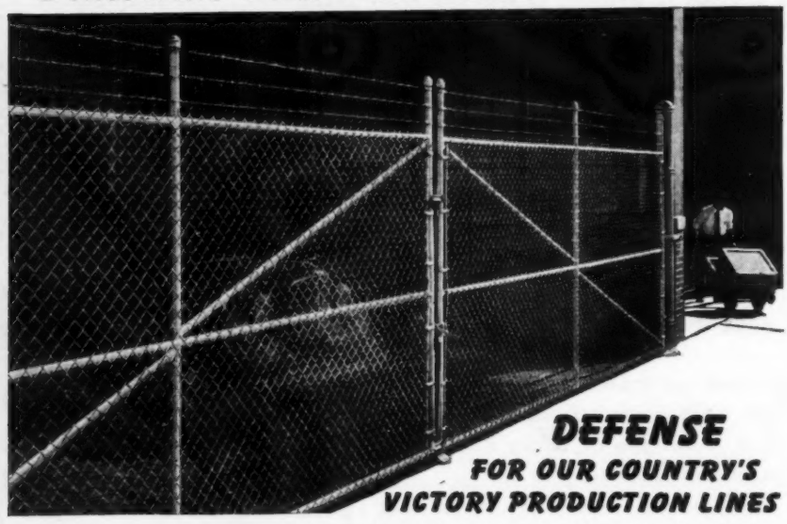
ON SHOVEL WORK
Giving you bulk material quick, without fuss, bother or expense is the job of this industrial IU tractor with shovel. Loads or unloads sand, stone, coal, fertilizer, snow, ashes and similar materials. Works in close quarters — inside or out. Dumps up to 7 ft. 3 in.

● GET ALL THE FACTS. WRITE FOR LITERATURE!

ALLIS-CHALMERS TRACTOR DIVISION • MILWAUKEE • U. S. A. **POWER FOR VICTORY**

PAGE FENCE

America's First Wire Fence — Since 1883



DEFENSE
FOR OUR COUNTRY'S VICTORY PRODUCTION LINES

● Waste is an enemy against which America must be safeguarded, and loss of production time or vital materials due to careless or malicious trespassing is dangerous waste. ● Now, more than ever before, industrial properties need the protection of Page Fence, the modern chain link barrier made by the company which was founded by the originator of woven wire fence in 1883. ● Distribution, construction engineering and erection of Page Fence are handled by local, responsible firms which are factory trained and long experienced—more than 100 independent firms which own their plants and hold membership in PAGE FENCE ASSOCIATION, Headquarters: Monessen, Pennsylvania.

VICTORY FIRST
At the Page mills, men, machines and materials are on an all-out schedule for production of fence to protect plants working on Government orders

PRODUCT OF PAGE STEEL & WIRE DIVISION—AMERICAN CHAIN & CABLE COMPANY, INC., BRIDGEPORT, CONN.

centage time" is allowed for such things as having tools ground, cleaning and repairing machines, and for instruction.

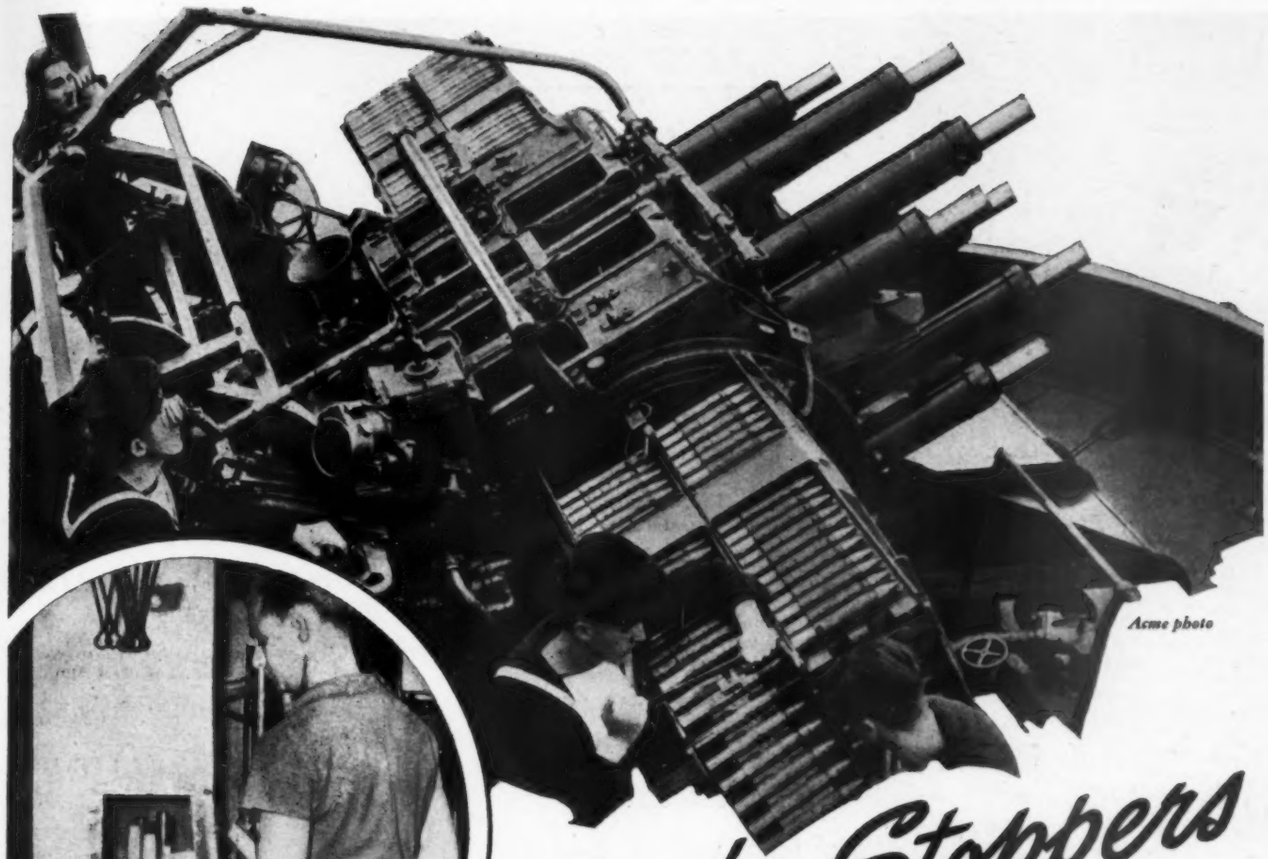
Records are kept of spoiled work. Pieces may be thrown out because of defective material; because of poor stock; or because they do not come within the prescribed "limits." Your foreman should always be consulted before a piece is thrown out for poor stock. A piece that is not within the limits given should never be passed on to the next operation except by permission of a foreman. The value of a piece increases rapidly when it is being machined. A few dollars' worth of steel may have increased in value one hundred times before it is complete. A mistake made on an early operation which is not discovered till later will be very costly. *A piece of poor stock or scrap must be reported to the time clerk.*

In this period of war emergency it has been found necessary to make some new rules. Identification buttons must be worn in sight at all times. The guards have authority to search anyone coming into or leaving the plant. If you are absent from work without adequate excuse or permission, it may be considered cause for dismissal. Clock cards must be punched regularly. If you miss, have your foreman sign the card.

We are all anxious to improve. There are many opportunities here, particularly in these times of rapid expansion. The intensive training that a "green man" gets is very valuable. The step up to a skilled machine operator is a long one. To go on from there to become a good all-round machinist places a man in an excellent position as to wages and job security. A machinist trained in Springfield, Vermont, can hold his own with any in the world.

Many difficulties arise in a shop working more than one shift. Any friction between day and night men slows production and makes work less enjoyable. An operator who is willing to cooperate seldom has any trouble. You will soon find that it pays to meet the man you work with more than half way. Come to work early enough to see his set-up, stay long enough to show him yours. Leave the set-up written down. In a job of this kind the Golden Rule will be found of very practical value.

J & L wants you to like working here. J & L wants your ideas on how the plant and machines can be improved. There are suggestion boxes and forms to fill out in many parts of the shop. All suggestions are carefully considered. Those that can be used are paid for. A reason for acceptance or rejection is always given.



Acme photo

Photo
Wayne Pump Co.

Stuka Stoppers

This naval anti-aircraft pom-pom battery sprays a pattern of 2 pound shell as a shotgun covers a flying clay target. With it a crack gun crew can quickly turn an enemy dive bomber into a "dead pigeon."

Each gun fires and reloads automatically with amazing rapidity. Yet its speed is hardly more amazing than that with which these same shell pass through the DeVilbiss Spray System that Wayne Pump Company uses for painting them. They enter as bare metal and come out automatically coated with asphalt inside and gray lacquer outside, dry and ready for loading, at a rate of 800 an hour.

Wayne's choice of equipment grew from years of experience with DeVilbiss Systems for finishing its well-known gasoline and oil pumps—plus the speed and efficiency these systems have shown in painting innumerable other types of arms and munitions in factories, arsenals and shipyards everywhere.

Our national need for increased war production is clear. Yet no assembly line can run faster than its finishing department. If your share in the job ahead means greater output — greater speed — prepare for it NOW by installing modern DeVilbiss Spray Painting Equipment.

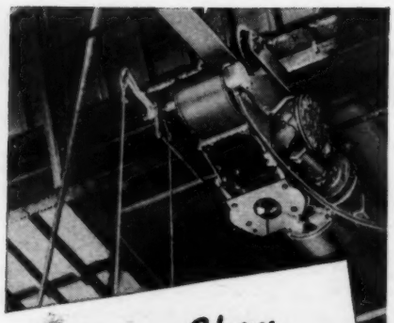
THE DEVILBISS COMPANY • TOLEDO, OHIO

Canadian Plant: WINDSOR, ONTARIO

• • •

THE COMPLETE DEVILBISS LINE CONSISTS OF: Spray finishing equipment • Automatic coating machines • Tanks for spray materials • Spray booths and exhaust fans for vapor and dust elimination • Air regulators, cleaners and dusters • Air compressors • Respirators • Specialized hose for paint, air, water, gasoline, welding and pneumatic tools • Hose connections • Water and oil guns • Equipment to prevent offset in printing • Paint stripers • Medicinal atomizers • Perfume atomizers.

DEVILBISS
SPRAY SYSTEMS



Success Story

IN 78 WORDS!

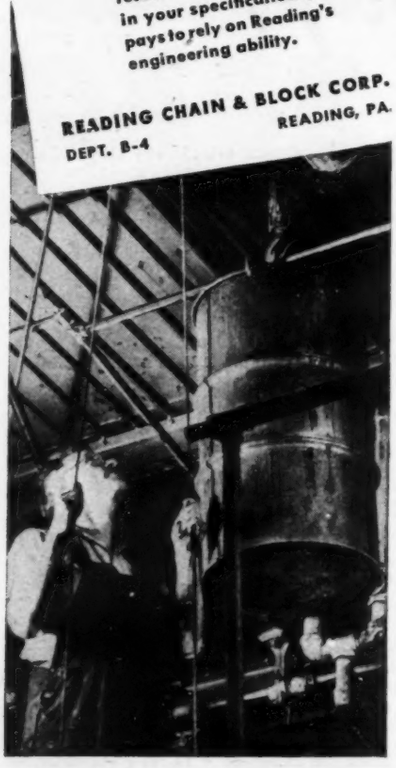
The Place: A plant producing heavy and fine chemicals.

The Problem: Lifting heavy drums of chemicals to a raised vat. When done with block and tackle, three men were needed to provide the proper lift speed. That took men away from nearby jobs and slowed production.

The Solution: This ½-ton Reading Electric Hoist paid for itself within two months—by keeping two men on their regular jobs 100% of the time and letting the third raise drums alone—in half the previous time.

• Remember that when results and savings are in your specifications, it pays to rely on Reading's engineering ability.

READING CHAIN & BLOCK CORP.
DEPT. B-4 READING, PA.



READING
Chain Hoists, Electric Hoists, Cranes and Monorails

BOOKS

SHARING INFORMATION WITH EMPLOYEES

Alexander R. Heron, director of industrial relations, Crown Zellerbach Corp. and Rayonier, Inc. Stanford University Press, Stanford University, Calif. 204 pages. $2.50.

Answers the questions of how to tell employees what the employer is doing or proposes to do; about the business in which they are engaged; the importance of the project on which they are working. Indicates what information should be shared, warns of some topics to be shunned, and specifies methods of sharing information that should be avoided, as well as outlining those that can be used successfully.

THE DYNAMICS OF INDUSTRIAL DEMOCRACY

Clinton S. Golden, director, and Harold J. Ruttenberg, research director, Northeastern Region, Steel Workers Organizing Committee. Harper & Bros., 49 E. 33rd St., New York. 258 pages. Index. $3.

Record of five years of negotiating collective bargaining agreements, adjusting differences of opinion between workers and management under the contracts, and developing practical techniques through which two traditionally hostile groups might cooperate. A frankly partisan book, that cites actual cases.

THE ROAD WE ARE TRAVELING 1914–1942

Stuart Chase. The Twentieth Century Fund, 330 W. 42nd St., New York. 106 pages. $1.

First of a series of books to be published under the general title of "When the War Ends" planned to show the trends of today that will make the world of tomorrow. The present book explores recent trends in American life and forecasts what are likely to be the chief questions facing the world at the end of the war. In five parts: "Pattern of Change, 1914–1942;" "Inventory of Basic Trends, 1914–1942; "Goals for America;" "Back to Business as Usual;" "The Problems We Shall Face."

MACHINE SHOP MATHEMATICS

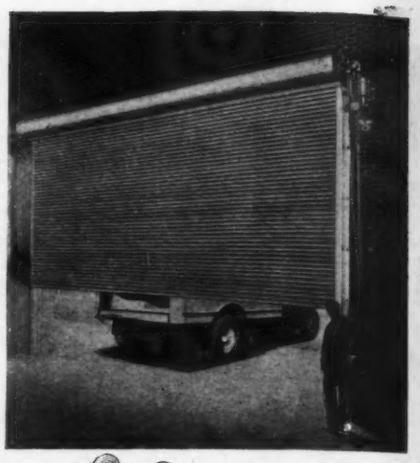
Aaron Axelrod, B.S., teacher of machine shop mathematics and science, The Bayonne Vocational and Technical High School. McGraw-Hill Book Co., 330 W. 42nd St., New York. 368 pages. Photographs, tables, drawings, sketches, index. $2.50.

A critical analysis of fundamental mathematical facts and procedures needed in the machine shop, presented in a way that will be helpful to the apprentice and to the mechanic who wants to brush up on certain topics. Adapted for use in vocational, industrial, technical, and trade schools, apprentice-training courses, and home study.

ENGINEERING ECONOMIC ANALYSIS

Clarence E. Bullinger, professor of industrial engineering, The Pennsylvania State College. McGraw-Hill Book Co., 330 W. 42nd St., New York. 359 pages. Tables, charts, drawings, index. $3.50.

Chief aim is to give students an understanding of the economic factors that are present in



KINNEAR GIVES YOU "THE BIG THREE" IN WARTIME DOOR NEEDS

ALL STEEL PROTECTION

Kinnear's tough, interlocking steel slat construction prevents theft or intrusion, resists accidental damage, defies fire, wind and weather—and even closes light-tight for blackout safety!

SAVINGS IN SPACE!

All Floor, wall and ceiling space around each opening remains clear and usable at all times when Kinnear Rolling Doors are installed. Another score for Kinnear's famous coiling upward action!

MOTORIZED EFFICIENCY!

Extra savings in time and labor are gained when Kinnear Rolling Doors are equipped for smooth, rapid, dependable motor operation. And this permits the further advantage of *remote control,* with convenient pushbutton stations placed at any number of convenient points.

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John Younger, professor and chairman of department of industrial engineering, The Ohio State University, Joseph Geschelin, Detroit editor of *Automotive Industries*. The Ronald Press Co., 15 E. 26th St., New York. 160 pages. Photographs, forms, tables, index, $3.25.

Revised edition of book first copyrighted in 1930. Written for two groups of readers—executives and others concerned with daily problems in industry, and for students of industrial management and engineering in college classrooms, with emphasis on the scientific aspects of management.

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BOOKLETS

PLANNING INDUSTRIAL RECREATION—G. Herbert Duggins, M.P.E., Fellow, Industrial Recreation, and Floyd R. Eastwood, Ph.D., professor of physical education, Purdue University, Lafayette, Ind. 82 pages. Photographs, forms, charts. $1.

OPTIMUM HOURS OF WORK IN WAR PRODUCTION. J. Douglas Brown, director, Helen Baker, assistant director, Industrial Relations Section, Princeton University, Princeton, N. J. 25 pages. 75c.

COMPETITION AS METHOD AND AS GOAL. Edwin G. Nourse. The Brookings Institution, Washington, D. C. 30 pages. 25c.

WORKSHOP SENSE. A book written for munition workers and other entrants into productive industry. W. A. Chapman. Longmans-Green, 55 Fifth Ave., New York. 58 pages. Drawings, charts. 60c.

AMERICAN RECOMMENDED PRACTICE OF INDUSTRIAL LIGHTING. Approved by American Standards Association. Illuminating Engineering Society, 51 Madison Ave., New York. 51 pages. Photographs, drawings, charts. 25c.

WARTIME PROBLEMS OF INDUSTRIAL RELATIONS. Thomas Roy Jones, American Type Founders, Inc.; Bryce M. Stewart, Deputy Minister of Labour, Canada; W. J. Brown, Assistant Clerks' Association, Great Britain. American Management Association, 330 W. 42nd St., New York. 28 pages. 75c.

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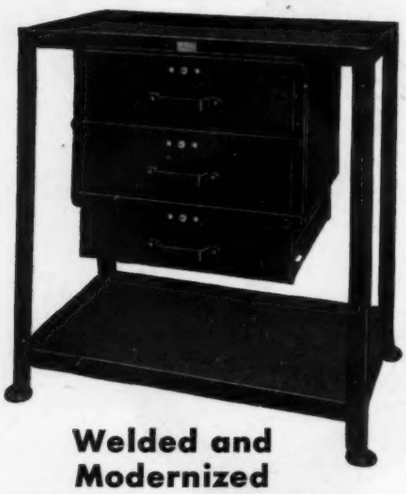

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ON THE CALENDAR

MAY

10–15, National Electrical Manufacturers Association, Annual Meeting, Hot Springs, Va. R. J. Blais, Convention Manager, 155 East 44th St., New York.

11–13, American Gear Manufacturers Association, Annual Convention, Hershey, Pa. J. C. McQuiston, Manager-Secretary, 602 Shields Building, Wilkinsburg, Pa.

11–13, American Institute of Chemical Engineers, Boston. Stephen L. Tyler, Secretary, 50 East 41st St., New York.

11–14, National Fire Protection Association, 46th Annual Meeting, Atlantic City. Percy Bugbee, General Manager, 60 Batterymarch St., Boston.

13–14, American Management Association, Production Conference, New York. Frank F. Gilmore, Conference Planning Manager, 330 West 42nd St., New York.

19–20, National Metal Trades Association, Annual Meeting, New York. Harry S. Flynn, Secretary, 60 East 42nd St., Room 710, New York.

21, American Iron & Steel Institute, Annual Meeting, New York. American Iron & Steel Institute, 350 Fifth Ave., New York.

25–28, National Association of Purchasing Agents, Annual Meeting, New York. G. A. Renard, Secretary, 11 Park Place, New York.

JUNE

5, American Management Association, General Management Conference, New York. Frank F. Gilmore, Conference Planning Manager, 330 West 42nd St., New York.

8–10, American Society of Mechanical Engineers, Semi-Annual Meeting, Cleveland. C. E. Davies, National Secretary, 29 West 39th St., New York.

15–17, American Society of Heating and Ventilating Engineers, Spring Meeting, St. Paul, Minn. A. V. Hutchinson, Secretary, 51 Madison Ave., New York.

22–25, National Association of Cost Accountants, Annual Meeting, Chicago. S. C. McLeod, Secretary, 385 Madison Ave., New York.

22–26, American Institute of Electrical Engineers, Summer Convention, Chicago. H. H. Henline, National Secretary, 33 West 39th St., New York.

22–26, American Society for Testing Materials, Annual Meeting, Atlantic City. R. E. Hess, Assistant Secretary, 260 South Broad St., Philadelphia.

JULY

22–25, Silver Bay Conference on Industrial Relations, 25th Annual Conference, Silver Bay-on-Lake George, N. Y. E. H. T. Foster, Executive Secretary, 347 Madison Ave., New York.

UNIVERSITY SUMMER COURSES FOR EXECUTIVES AND ENGINEERS

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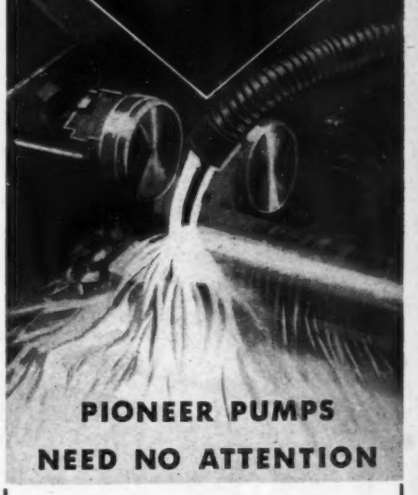

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